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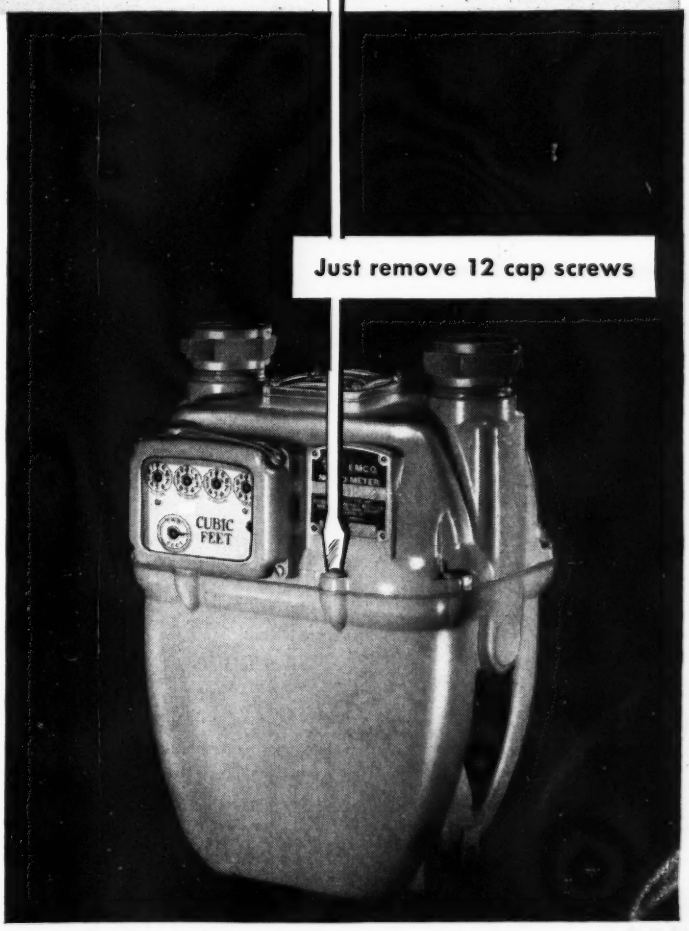

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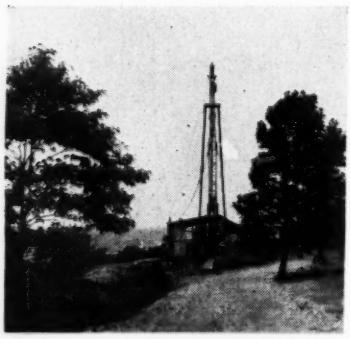

GAS PIPELINE companies are turning their attention to the drilling rig as emphasis shifts to underground storage. See page 75.

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Technical Trends

guy corfield

Atom Bombs

Out of the variety of discussion that one currently hears and reads on the use and effect of atomic bombs there appears to be emerging the assurance that these bombs are not as infinitely destructive as we were originally led to believe, and that the death and injury that is created is from the initial blast, radiation, falling debris, and subsequent fire and not from the later radioactivity effects. This is somewhat comforting if we think of ourselves on the receiving end, but not so reassuring if we try to believe that our asserted superiority in atomic weapons makes us immune from attack or able to overwhelmingly retaliate if necessary.

Recently the ASTM New York District sponsored a meeting on "Effects of Atomic Bombing" with Edward J. Kehoe, chief, Fire and Accident Branch, New York Operations Office, U. S. Atomic Energy Commission, as one of the principal speakers. The ASTM *Bulletin* of December 1950 gives an extended abstract of Mr. Kehoe's discussion and the following points developed in this abstract may be of interest.

An atomic bomb could be released so as to explode in four different ways: in the air, some distance above the ground; very close to the ground; underground; and underwater, in a harbor or close to the shore. The high air burst such as released at Hiroshima and Nagasaki would be the most destructive over the widest area. It would damage structures, and kill or injure people by direct concussion and flying and falling debris, and to a much lesser extent by immediate radiant heat and radioactivity, over a circular area of one or two miles radius. Fires would be started not so much from radiant heat as from disruption and scattering of fires already burning in stoves, furnaces, etc., short-circuiting of electric wiring, and breakage of aboveground fuel supply lines. Underground piping systems would suffer relatively little damage execpt where aboveground connections would be torn away. Except in the center half-mile radius, people could survive the blast if screened from the initial radiant heat and falling debris. There would be very little if any danger from residual radioactivity.

A burst just above the ground would have generally similar effects to those of a high air blast, but over a much more limited area. Underground installations would be severely damaged directly beneath the burst. Dangerous residual radioactivity might be encountered only in the central area where the torn ground would be left active. A burst below ground would have the effect of a strong earthquake across an area about a mile in diameter, and would cause similar destruction both below and above ground. There would be no tremendous air blast damage. Dangerous residual radiation would probably be encountered in the central cratered area. A bomb detonated under water in a shallow harbor would destroy the localized shipping but not greatly damage piers and breakwaters. Air shock would be considerably less than from an air explosion, and serious damage confined to about a half-mile radius. Waves from 10 to 20 ft high would do some shore damage. The shore and adjacent land fringe would be showered with radioactive water, but the radiation hazard would not be great enough to prevent necessary fire fighting and rescuing.

Apparently radioactive effects, other than at the time of the explosion and in its center, have been greatly magnified and overemphasized. In the two Japanese cities, only about 10% of the deaths were directly attributable to radiation, and *there were no cases of damage to human beings from residual radioactivity*. It is explained that while elaborate precautions are taken to protect people working in atomic factories because they are exposed over long and repeated periods, a person working for a short time under emergency conditions such as rescuing injured or fighting fire following an atomic burst, could take 500 times the established factory tolerance without permanent ill effects. Actually, in the case of an air burst, the radiation phase is over in a few seconds and even the bodies of people killed by lethal radioactivity can be handled safely.

It would therefore seem that a mass exodus of population from even the immediate vicinity of an atomic explosion would not be necessary, that rescue and fire fighting work in the area not totally demolished could proceed without more hazard than normally exists following an explosion, and that there is no foundation for the fear of insidious poisoning and other lingering and long-time aftereffects.

Infrared Cooking

According to the Jan. 1, 1951, issue of *Life*, the latest in domestic electric ranges is provided by infrared top cooking elements. These elements are infrared lamp bulbs, manufactured by Sylvania Electric Products, installed pointing upwards directly beneath flat circular translucent plates which form the surface on which the cooking vessels are placed.

These plates or "lids" are colored red to permit passage of the infrared rays, and the bulbs radiate heat through them to the vessels producing a red glow which it is stated introduces a theatrically new look to the kitchen as well as a scientifically new principle of cooking. It is claimed that unlike coils which warm gradually, these new elements radiate full heat immediately they are turned on. The lids, made of high silicon glass, can operate up to a temperature of 1400° F and will not crack if ice water is poured on them while they are hot.

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Effects of Conversions on METERS

THE SCRAMBLE for knowledge of changeover practices and experiences on the part of New England gasmen has brought forth an increasing volume of articles based on the results of conversions in other parts of the country. Such a study is this revised version of the talk Mr. Pickford, manager of gas engineering for the Northern Indiana Public Service Co., Hammond, gave Dec. 12 in Boston at the New England Gas Assn.'s meter conference.

Mr. Pickford's method of highlighting problems faced by his company, which has had a long history of conversions at its various properties, should prove helpful in pointing out critical aspects of the procedure which may guide other meter superintendents in similar situations.

J. M. PICKFORD

METERING, as it is affected by changeovers from one type of gas to another—and particularly to natural gas or natural gas mixtures—is a phase of operation that cannot be adjusted on any set formula. Procedures must, of course, be set up in such a way as to give the best service to the customer while protecting the interests of the company.

Each situation will have to be met in its own way. Nonetheless, certain observations can be made on the basis of our companies' experiences. We believe our service to customers and the cost of rendering this service have been satisfactory.

The experiences of Northern Indiana Public Service Co. and associated companies with changeovers dates back to the beginning of the century. Gas service is being given to 60 communities throughout the northern portion of the state of Indiana and the districts range in size up to 42,000 meters. Fort Wayne, Gary, South Bend, and Hammond represent the largest communities served. The company handles a variety of gases such as coke-oven gas, water gas, liquefied petroleum gases, refinery gases, and natural gases. One of the first long distance natural gas lines in this country was laid through our territory in 1896.

As a basis for this discussion, the material available since 1923 was studied. Changeovers were made to other gases as well as to natural gas and the experiences from these changeovers have been helpful.

Where Troubles Lie

When gas systems are changed over to natural or drier gases, any troubles that do develop are usually caused by the relative dryness of the gas. The humidity of the gas and the condensibles are factors of primary importance. Experience has emphasized that the theoretical assumptions regarding leather diaphragms and meters being affected by moisture, oils, and condensates are correct and that some meter troubles will occur after changeovers to the drier gas or to a gas that has an affinity for condensates or solvents removed from the previous gas. Manufactured gas is usually saturated with light oils and water. Vapors will dissolve in the filler of stuffing box packings. Constituents in manufactured gas causing gum formation and deposition of gums in the meters are important causes of poor meters. Natural gas or a drier gas will absorb condensates.

In general, in our changed-over properties there has been a swing from a greater percentage of slow to a greater percentage of fast meters. Our average accuracy figures in some districts increased to a high of 102+. In certain territories the percentage of "don't-registers" increased to 3%. Examination of interiors of meters revealed some drying, bleached, stiff, and hard diaphragms and drying out of packing. In one particular area the situation was quite severe, whereas in others very little difficulty was experienced.

In the Hammond-Whiting area, which had been originally converted to medium pressure transmission coke oven gas in 1922, and again converted in 1932 to a mixed 1000-Btu gas (100% natural by 1947), the meter situation has remained fairly healthy from 1926 to date. There has been a slight trend to the fast side (101 average accuracy and 20% of the incoming meters fast) which is counteracted by setting the meters to 0.99. Area "F" comprising some 35,000 meters was changed to natural gas from manufactured coke oven and water gas in 1937, and we did experience average accuracies up to 102.5 and up to 35% of the incoming meters on the fast side. From 1932 to 1939 a fairly heavy meter change program was in effect because of the 5-year change period, changeovers, and a concentrated program on unaccounted-for gas.

Poorest Meters

District "S" is still on a 570-Btu gas standard but has gone from a 570-Btu carburetted water gas to a 570-Btu mixed blue, propane and natural, refinery and coke oven gas. This area has had, and continues to have, the poorest meters, although there has been some improvement. It will be changed over to 1000-Btu pipeline mixed gas and natural gas within the next two years. We do not plan any wholesale changing of meters, but expect to take troubles in stride although we will follow the situation closely. We anticipate an improvement after several years of pipeline gas. Plant figures or methods of plant operation can cause added distribution expenses and headaches. Of course, with the best practical methods of operation, condensates will appear in distribution systems.

The percentage of D.R.'s and percentage of slow meters in this area are the highest in the company. Average accuracy figures last year were 0.96 which is attributed to the quality of the gas that was produced, the gums and condensates that dropped out, and the corrosion in the meters. However, unaccounted-for figures are good; therefore, we

Mr. Pickford Answers 20 Questions on Meters

1. *What type of valve should be used?* Generally white metal.
2. *What packing should be used?* Felt washers.
3. *What dressing or lubricant should be used with the packing?* Felt washers with No. 25 Allube grease or felt washers with Standard Oil graphite grease.
4. *What kinds of meter index glass frames and indexes are desirable?* Soldered glass on new meters and puttied glass on old meters.
5. *What types of diaphragms should be used?* Bark tan and semi-chrome and composition.
6. *What weight of leather should be used?* Medium.
7. *What is the effect of drying out?* It causes stiffening, seam and cord leaks. Small holes in the leather are caused by continual wear in the creases of the diaphragm. There would be some bottom failure and shrinking of diaphragms resulting in fast meters.
8. *What type and composition of diaphragm dressing should be used?* A heavy dressing from the manufacturer is recommended.
9. *What pressure would be used in testing?* From 1½- to 2-in. w.c.
10. *What should casing test pressure be?* Two pounds.
11. *Should reoiled diaphragms be tested?* Yes, after oiling and before oiling.
12. *Will meters be more noisy?* Yes.
13. *What type of oils should be used for diaphragms?* Our meter department recommends the use of heavy oils.
14. *Are oil bath or dipping treatment recommended?* No, not by our company.
15. *What is the life expectancy of new diaphragms with natural gas?* Thirty years or more.
16. *What type of gasket should be used for meter loop washer packing and for meter inlet and outlet locknuts?* Synthetic gaskets are preferred by our company.
17. *What steps should be taken prior to a changeover?* Begin oil-fogging (from the distribution system standpoint), bring change period up to schedule, be more critical of diaphragms, install a higher percentage of new diaphragms, increase oilers and use heavy oil, and condemn old style meters more readily.
18. *Should rehydrators be used?* We have used rehydrators and believe they have merit under certain conditions. Maintaining the same humidity will naturally prevent drying out, but we feel that dry gas will be more desirable over a period of years.
19. *Should dust traps and collectors be used?* We use them extensively.
20. *What is the effect of natural gas on diaphragms?* This question has to be modified. Where condensates are present, there will be some drying out and possibly hardening and bleaching. On new diaphragms there will be no noticeable effect, which means that the life of these will be very long.

do not feel justified in stepping up the meter program.

It has been our practice to analyze the condition of meters prior to conversion, the kind and composition of the gas, the pressure of gas being delivered, the cost of the gas, the unaccounted-for gas, the type of distribution system, and the humidity of the gases. These factors have influenced us in our program.

Certain fundamentals must be kept in mind when a program is being established. For example, only .007 of an inch change of tangent length or increased stroke makes 1% difference. Drying out of diaphragms can cause changes. Excess wear of parts caused by deposits or corrosion affects meter accuracy. Any leak through a valve, partition, diaphragm, or flag rod stuffing box will affect registration.

Oiling or Reoiling

These conditions are more likely to occur after changeovers.

The question of oiling or reoiling is one of the details with which companies contemplating a changeover are much concerned. Some companies bring all meters in for reoiling immediately after a conversion. Some reoil diaphragms in the field, using such methods as the dipping method. We do not favor this practice, our contention being that the capillary action of rise of the oil in the diaphragms is questionable, and we feel there is a possibility of the lower portion of the diaphragms being affected adversely. One large company drills four holes in the lower portion of the meter and adds up to a quart of oil. We do not follow this practice. Another large company punctures holes in the bottom when meters are brought in, adds a considerable quantity of oil, and then rotates the meters.

We do oil a larger percentage (about 75%) of the incoming meters than normal after a changeover. Our present policy is that diaphragms must be reoiled with a heavy meter oil after 12 years in service. This policy will be changed and the period lengthened. We use a neutral petroleum base oil furnished by meter manufacturers. About 1 oz of the heavy oil is placed in each diaphragm through the valve ports after the backplate is removed. The meter is removed to a rack which is steam heated to 130° F. The meter is shifted and rotated every one-half hour for two hours. One large company changed diaphragms and oiled all incoming meters with a heavy oil prior to changeover, and its figures are very good as to accuracies.

We do believe in and practice oil-fogging, primarily from the distribution system need, realizing that the limits of travel of the oil are restricted. Oil-fogging should be instigated well in advance of a changeover. We have had indication of oil up to 3½ miles from the oil-fogger, our fogging rates depending upon the season of the year. We have had no indication of harmful effects on the meters.

Unaccounted-for gas is now less than one-third of the amount lost at the peak. In 1933 serious thought was given to this subject because of abnormal figures, and one of the items carefully studied was the metering. The high unaccounted-for gas was due to a number of factors such as corrosion, pressures, changeovers, metering, and theft of gas.

In certain areas we have been suspicious of the metering. Examination of interiors has been one tip-off. On slow light tests made on meters in these areas, the percentage of failures was high. Records on old-style meters indicated the need for more condemning. So we have condemned as many as 20% of the meters, although this percentage has since tapered off and for the past 10 years the ratio has been but 7% of incoming meters.

We reviewed metering reports, found average accuracies as low as 92% in one district, the percentage of correct meters as low as 45%, with D.R.'s as high as 4%.

Another reason for our suspicions was the record of sacrifices on major repairs under certain conditions of enforced curtailment of activity. *Table 1* gives an idea of results of tests on incoming meters which reflects this situation.

Suspicious

Meter records, performances and route books were studied. If meters showed gums, condensates or corrosion, it was expected that a change to a drier gas would result in faster meters and more D.R.'s and more noisy meters. For several years after a changeover, studies were made for drying out, bleaching, and hardening of diaphragms, internal corrosion, internal leakage, etc. More thorough examination of incoming meters than one would normally make was undertaken.

General or diaphragm repairs on incoming meters were stepped up so as to insure against diaphragm trouble. Slow light or 4-point and low flow check tests were made on a higher percentage of incoming meters. The obtaining of useable data through various tests is highly important.

Our policy has been to adhere to the statement in the U. S. Department of Commerce Standards for Gas Service: "It is undesirable to incur an expense for meter testing greater than the aggregate errors in one direction which will be prevented thereby." It is essential that the items of meter expense be a minimum compatible with good performance.

In making an analysis of poor metering, the route books were studied for low consumption, gradual cease meters, and for suspicious meters as to type, age in service, and date of last major repairs. Performance studies were made of the different types and classes of repair meters.

Cross-sectional studies in different districts revealed that in certain territories a rather high percentage of meters did not register on ¼ ft per hour tests. These cross-sectional studies aided us in ascertaining where to concentrate. Not all of this could be blamed on changeovers. In concentrating on the metering, we undoubtedly turned up conditions such as poor repairs in certain districts and the justification for condemning certain types of old-style meters. We found that in certain districts the customer's metering was healthy; in others, remedies were applied. An individual company's conditions must be thoroughly studied before making specific recommendations.

The methods pursued can be justified by the unaccounted-for, the customers' reaction and the maintenance costs.

TABLE 1. INCOMING METER TESTS

1944	1947	1948	1949	
73.08	72.35	72.84	76.18%	Correct meters
.98	1.11	1.08	0.82%	D.R.'s
8.93	7.51	7.34	8.17%	Over 2% slow
14.97	17.46	17.20	13.55%	Over 2% fast
1.31	1.32	1.25	1.09%	Stuck
0.73	0.25	0.29	0.19%	No test
99.76	99.49	99.46	99.57	Average accuracy

Class of Repairs	1940	1949*
Condemns	7.8%	6%
OK's	3.6%	8%
Adjusts	1.3%	2%
Partial	53.4%	65%
Generals	17.4%	9%
Diaphragms	16.5%	10%

*Repair records were not kept up to date in all districts.

Time Table

A time table of our meter change program would reveal a limited and reduced meter change program 1929 to 1932, an accelerated meter change repair and maintenance program from 1933 to 1940, a decided dropping off from 1941 to 1948, and a gradual pick-up since.

The limited program was caused by the depression and the necessity to conserve. As business conditions improved slightly, the desire to regain lost time. changeovers that were being made, and the unaccounted-for gas situation brought about an acceleration of the meter change schedule.

The drop-off which came again in 1941 was caused this time by an extremely healthy meter situation, as well as the loss of trained personnel to the armed forces. State commission approval of lengthened meter change intervals made the policy change possible.

So now the tempo has once again picked up. Since 1948 we've wanted to catch up on recommended changes. Certain districts have reported a volume of unaccounted-for gas and results of meter tests that show the need for a newly accelerated schedule. District shops have been remodeled and modernized to enable us to follow this procedure.

Previous to 1924 the local districts did most of their own meter repairs, including major repairs. After an investigation of the meter repair costs based on 1923 figures, we decided that a central meter repair shop should be maintained for the handling of all major repairs, which was expected to result in an annual saving of approximately $15,000. Based on one-fifth of the meters changed each year, we determined that 50% require major repairs, freight rates amount to 34 cents per meter, and savings total $1.50 per meter for major repairs.

This plan was put into effect.

In January 1932 the system was modified to have a common badge for all affiliated company meters and not necessarily to send the same meters back to the town sending them in. The company had what is called the "central repair shop and common badge method." This shop was located in South Bend. The system is now being modified to allow Gary, Fort Wayne, and Hammond to do major repairs, because of much smaller percentages of major repairs and freight or transportation rates.

Changing gases is a radical departure from a routine that has been followed for years and is bound to bring up problems such as the one of metering. As developed in the previous comments, the problems will *depend upon the present condition of meters and distribution system*, the *kind and pressure of gas delivered*, and *present meter shop practices*. Each situation must be thoroughly studied and analyzed.

The ultimate result will work to the advantage of all concerned. Eventually, a much healthier meter situation will require less maintenance and the meter change period may be extended economically.

Liberation of dust and dirt, more noisy meters, the moving of naphthalene deposits, the drying out of diaphragms, the speeding up in proofs, increased D.R. meters, and higher unaccounted-for gas figures may be expected.

Do not be unduly alarmed about the metering phase. Install oil-foggers and dust traps and study incoming meters very carefully. Study the route books for suspicious meters and observe the proofs carefully. If conditions begin to indicate the need for an accelerated meter change program this can be placed in effect after the changeover. There may be some situations that will necessitate programs involving new diaphragms on practically all of the meters, but these will be few.

Next Summer's Plans

Next summer a changeover will be made in one of our areas that has always had, in my experience, the poorest meters in the company. We expect to use the above plan, but in another six months we may find the need for stepping up the meter change program in this particular area. My suggestion in this area is that we change diaphragms, if they indicate some deterioration, that we oil diaphragms liberally and that we have a liberal condemn policy. I am in favor of increased major repairs for this area.

The entire economic side of the picture with *respect to unaccounted-for gas, customers' relations, commission rulings, repair costs, removing and resetting costs* must be kept firmly in mind.

A report to our management in 1940 stated: "The records show that because of improvement in gas conditions, in meters, in meter shop methods, and liberal policy on condemns it is uneconomical to change meters on a 5-year basis."

After studying our records and reports, the commission extended the change period to seven years.

This proves the value of good records and close observance of the metering phase. We are now recommending a 10-year change period for most of our districts, proving that the drier, clean gas will eventually be beneficial.

Selecting the Prop

Regulator for

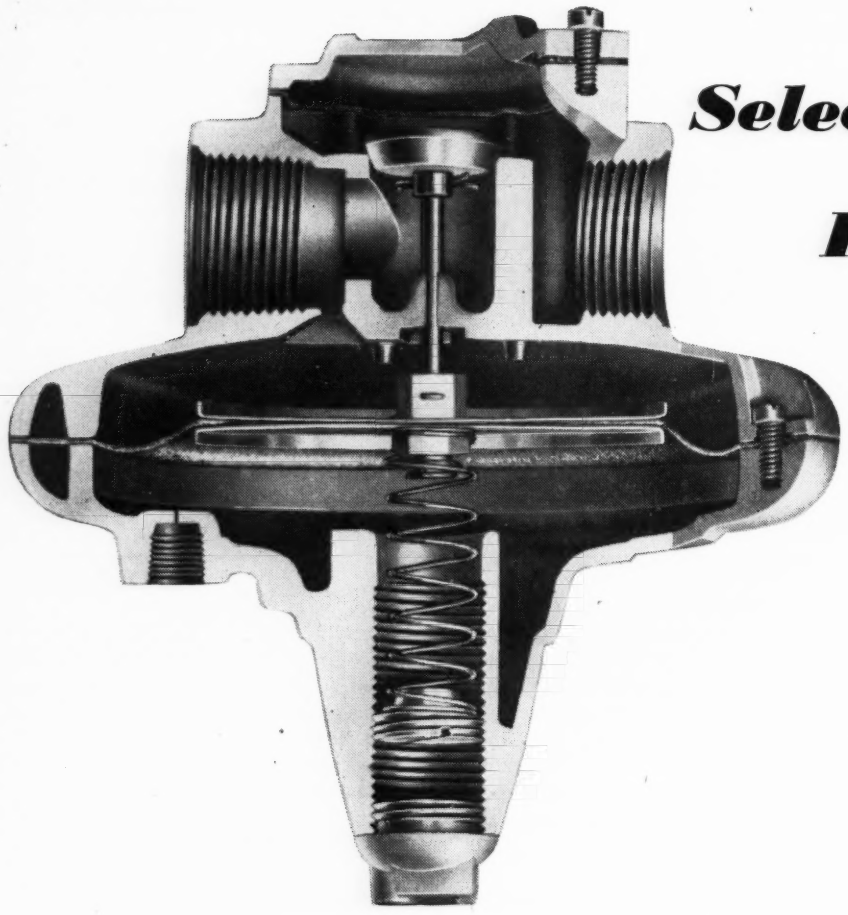

Fig. 1. A typical modern gas appliance regulator, shown in cross section.

MANUFACTURERS of appliances using gas as a fuel—ranges, water heaters, refrigerators, furnaces, boilers, and unit heaters, as well as all the cooking, heating, and heat treating equipment used by commercial establishments and industry—are paying increasing attention to the subject of proper gas pressure regulation at the appliance. They are achieving this regulation largely with those widely available and standardized devices known as "appliance regulators."

Exclusive

Too often, however, regulator selection is made solely on a basis of price and pipe connection size. And too often proper understanding of regulator performance characteristics and capacities is lacking.

The manufacturer's interest in pressure regulation always hinges about product performance. With close and automatic regulation of gas supply he can design controls, burner systems, combustion chambers, and flues to closer tolerances—with confidence that the finished system will function as designed.

In *Fig. 1*, in cross-section, is shown a typical modern gas appliance regulator, and in *Fig. 2* are shown typical performance curves for this type of regulator (obtained in conformity with the American Gas Assn. test method).

Ideal regulation, of course, would be an absolutely horizontal line (constant regulator outlet presure) clear across the graph, irrespective of the rate of flow of gas through the regulator. Such ideal curves can be approached by design focused only at performance characteristics without regard to cost, size, or practicability. Dead-weight loading of the diaphragm rather than spring-loading—or even the use of a small auxiliary regulator feeding constant pressure gas to the top of the diaphragm (the pilot-loading principle) —would help to approach such a result. Both methods are employed in large utility district pressure regulating systems. There is no need, however, to go to such extremes to bring the benefits of good pressure regulation to the manufacturers and users of domestic and commercial gas equipment.

In practical gas appliance pressure regulation, therefore, the ideal performance curve is approximated (see *Fig. 2*) through knowledge of: (1) spring design, (2) diaphragm design, (3) valve design, and (4) the pressure relationships in flowing gas streams within the regulator body.

In *Fig. 2*, P_i refers to regulator inlet pressure, P_o designates outlet pressure. When testing, the regulator is so adjusted that with an inlet pressure of 7.0 in. equivalent water column and a throughput specified by AGA according to the pipe size of the regulator, the outlet pressure will be 2.5 in. equivalent water column. Appliance regulators are set at this adjustment point and two series of observations made to obtain the curves illustrated. One curve is obtained by maintaining the inlet pressure constant at 3.5 in., varying the throughput in successive steps, and recording the outlet pressures resulting. The second curve is obtained similarly except that the inlet pressure is maintained at 10.5 in. equivalent water column.

C_1 is known as the "regulation capacity." This is the throughput at which the outlet pressure at either 3.5 in. or 10.5 in. equivalent water column inlet pressure first differs from the adjustment outlet pressure (2.5 in.) by 0.5 in. equivalent water column.

A C_2 exists which is not indicated because it does not fall on the graphs. C_2 is the throughput at which the outlet pressures indicated by the 10.5 in. and 3.5-in. inlet pressure curves first diverge by 0.5 in. equivalent water column. Actually, the lesser of C_1 or C_2 is considered to be the regulation capacity. However, in this case C_1 is obviously the lesser of the two and is the regulation capacity.

C_3 is not determined by the curves but is indicated on the graphs for completeness. C_3 is known as the "pressure drop capacity" and is determined with the regulator valve in the wide-open position, assumed as the result of normal operation at a constant inlet pres-

...pressure ...r appliance

By E. V. BISHOFF

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sure of 2.0 in. equivalent water column. Throughput is then regulated until the pressure drop across the regulator, as indicated on a differential pressure gage, is 0.3 in. equivalent water column.

The numbers beside C_1 and C_3 are the respective rate-of-flow figures for gas and air.

Economic and engineering factors permitting, the spring should be as long and flexible as possible so that the force exerted on the top of diaphragm is as nearly constant as possible over the entire spring range. In this connection, note the right hand column in *Table 1*. The larger, more flexible, and lighter the diaphragm, the better the performance curve. Valve construction is a chapter in itself, involving such factors as (a) seating and stem friction, (b) the thrust on the valve as the gas passes upward through the valve opening (inlet pressure effect), (c) the influence of valve and seat shape upon flow, and (d) the turbulence (and static pressure relationships) in the stream immediately beyond the valve. In most large appliance regulators, double (balanced) valves are employed to offset the inlet pressure effect and to obtain better performance characteristics. The eddy currents, venturi effects, and static pressures in the exit streams from a regulator valve influence the relationship between the pressure which communicates to the bottom of the diaphragm and the pressure at the point of use or test.

By manipulating the several design factors, the regulator manufacturer can provide any of the three types of performance curves shown in *Fig 2*—essentially flat, descending, or rising. Unfortunately, he cannot produce precisely the same type of curve at all inlet pressures. He must design for the best characteristics within the intended ranges of regulator usefulness (both range of throughput and range of inlet pressure) in line with the cost of materials and manufacturing, and size limitations.

The wise designer will consult performance curves for the type and size of regulator he is considering, and will note on these curves the rates of flow through the regulator which will be encountered on his appliance in service. He will also consider the variation in inlet gas pressure to the regulator which will be encountered in the field, and will give attention to the shifts of the performance curve with varying inlet pressures.

To assist appliance manufacturers and installers in selecting gas appliance regulators to best advantage without reference to scores of performance curves, appliance regulator manufacturers publish tabular information of the types shown in *Tables 1 and 2. Table 1* relates to regulators designed for ap-

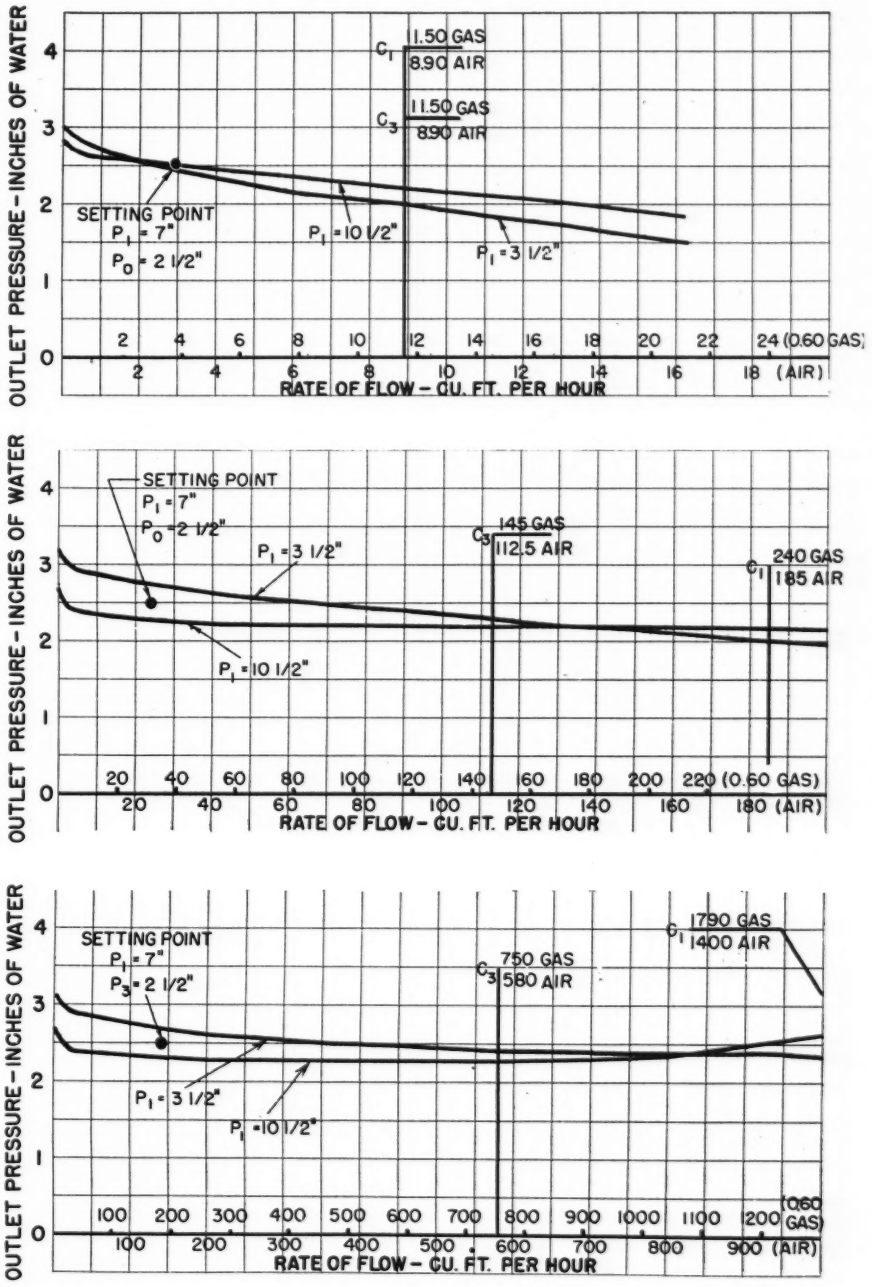


Fig. 2. Typical gas appliance regulator performance curves. C_1 is the "regulation capacity" and C_3 is the "pressure drop capacity," as determined by AGA testing procedures. Whichever is the lesser is the capacity of the regulator.

pliances used in the home and in commercial establishments (restaurants, hotels, and the like) to which gas is delivered at the low pressures characteristic of domestic supplies. *Table 2* relates to appliance regulators of the type used in industry, where pipe sizes and gas requirements are very much larger and supply pressure may be measured in pounds per square inch rather than in inches of water column. In this table, P_i is inlet pressure and P_o is outlet pressure.

The line sizes covered by tables of the type shown in *Table 1* range from the smallest pilot lines where gas pressure regulation is the key to the prevention of pilot outage, through the pipe sizes customarily used on refrigerators and ranges and water heaters, up to the larger pipe sizes which supply the burner systems of basement furnaces, boilers, and commercial cooking and heating equipment.

All gas appliance regulators listed in the AGA Directory of Approved Appliances and Listed Accessories have two capacity ratings, i.e., "Gases 800 Btu per cu ft or More" and "Gases Less than 800 Btu per cu ft." The former is normally applied for use with natural gas; the latter with manufactured gas. The AGA capacities, in nearly all cases, are based on the "pressure drop capacity" of the regulator. This is the capacity of the wide-open regulator, in cfh of .6 sp gr gas, at .3 in. w.c. pressure drop across the regulator. *Table 1* shows this information. Due to AGA limitations on the allowable pressure drop across the complete appliance manifold (usually 1 in. w.c.), the allowable pressure drop across the regulator is generally limited to .3 in. w.c. Where this is the case, the regulator should be selected on the basis of its capacity as listed in the AGA directory. In cases where pressure drop across the manifold is not critical, the AGA capacities for the regulator may be exceeded by increasing the pressure drop across the regulator to .4 in. or .5 in. w.c. and calculated as follows:

If the allowable pressure drop across the regulator can be increased to .4 in. increase the AGA ratings by $\sqrt{\frac{.4}{.3}}$ *or 1.15.*

If the allowable pressure drop across the regulator can be increased to .5 in. increase the AGA ratings by $\sqrt{\frac{.5}{.3}}$ *or 1.29.*

However, to obtain the benefit of the increased pressure drop, the appliance including the regulator should be tested and approved by AGA on this basis, unless AGA approval is not required.

Regulator capacity tables are only a guide and should not be regarded as the sole criterion in the proper selection of a regulator. Different makes of regulators do not necessarily perform the same, even though their capacities may be identical. By referring to performance curves and running laboratory tests, the characteristics of the regulator in question will be revealed in detail. This information, if applied to the appliance, will pay dividends in improved performance. Don't just select the regulator that is big enough and costs the least. Decide exactly what you want the regulator to do; then select the regulator that will come closest to meeting your requirements.

TABLE 1. Guide to selection of domestic gas appliance regulators*

¾-IN. SIZE MAX. $P_i = 2$ PSI — MAX. $P_o = 1$ PSI
ALL OTHER SIZES MAX. $P_i = 5$ PSI — MAX. $P_o = 1$ PSI

Size Regulator (Inches)	Capacities in cu ft per hour for 0.60 sp gr gas at differential pressures (inlet minus outlet) of					
	2" w.c.	4" w.c.	6" w.c.	8" w.c.	0.5 psi	1 psi
¾	350	480	600	750	900	1100
1	1000	1250	1500	1750	2000	2200
1¼	1500	2000	2500	2800	3200	5000
1½	1800	2300	2800	3100	3500	5500
2	3000	4000	5000	5500	6000	9000
2½	3600	5000	6000	7000	9000	14,000
3	5000	7200	8800	10,000	12,000	17,000

NOTE: For specific gravities other than 0.60, multiply the listed ratings by the square root of 0.60 and divide by the square root of the specific gravity of the air or gas under consideration.

*For homes and commercial establishments to which gas is delivered at low pressures characteristic of domestic supplies.

TABLE 2. Guide to selection of regulators for industrial uses*

Reg. Size	Connection Size	AGA Rating Btu Per Hour		Rating Cu Ft Per Hour (0.60 sp gr gas at pressure drop of)			Normal Spring Range
		800 Btu or more	Less than 800 Btu	0.3"	0.4"	0.5"	
⅛"	⅛"—27	8510	5750	11.50	13.23	14.84	2" to 6"
	⅛"—27	8510	5750	11.50	13.23	14.84	4" to 12"
	¼"—18	8510	5750	11.50	13.23	14.84	2" to 6"
	¼"—18	8510	5750	11.50	13.23	14.84	4" to 12"
¼"	¼"—18	37,000	25,000	50.0	57.50	64.50	2" to 6"
	¼"—18	29,600	20,000	40.0	46.0	51.60	4" to 12"
	⅜"—18	37,000	25,000	50.0	57.50	64.50	2" to 6"
	⅜"—18	37,000	25,000	50.0	57.50	64.50	4" to 12"
	½"—14	37,000	25,000	50.0	57.50	64.50	2" to 6"
	½"—14	37,000	25,000	50.0	57.50	64.50	4" to 12"
½"	½"	107,500	72,500	145	167	187	2" to 4.5"
	½"*	107,500	72,500	145	167	187	2" to 4.5"
	½"	92,500	62,500	125	143.75	161.25	4" to 12"
	¾"	111,000	75,000	150	173	193	2" to 4.5"
	¾"*	111,000	75,000	150	173	193	2" to 4.5"
	¾"	92,500	62,500	125	143.75	161.25	4" to 12"
¾"	¾"	180,000	121,500	243	280	314	2" to 6"
	¾"	133,200	90,000	180	207	232.20	4" to 12"
1"	1"	333,000	225,000	450	520	580	2" to 6"
	1"	333,000	200,000	400	460	516	5" to 12"
	1¼"	388,000	262,500	525	605	680	2" to 6"
	1¼"	388,000	262,500	525	605	680	5" to 12"
	1¼"F	388,500	262,500	525	605	680	2" to 6"
	1¼"F	388,500	262,500	525	605	680	5" to 12"
1¼"	1¼"	555,000	375,000	750	865	970	2" to 6"
	1¼"	503,200	340,000	680	782	877.20	5" to 12"
	1¼"F	573,500	387,500	775	895	1000	2" to 6"
	1¼"F	503,200	340,000	680	782	877.20	5" to 12"

*Bottom inlet.

*For types used on burner systems of basement furnaces, boilers, and commercial cooking and heating equipment. P_I = inlet pressure, P_O = outlet pressure.

How Utility-Produced MOTION PICTURES Pay for Themselves in Goodwill

PG&E's publicity supervisor reviews his company's highly successful history in motion picture production, shows how films can be star performers in the unceasing task of wooing public opinion.

By A. James McCollum

AN important new addition to the tools with which a public utility company may communicate with its customers and with the general public has been developed in the past few years. After a rapid rise from infancy, the new addition—motion pictures—stands today as an adult member of the public relations team.

Public relations in the utility industry is a never-ceasing job. The company that worries about it only when a problem arises is making a mistake, for then the horse is already out of the barn. The job of the public relations staff should be a constant one of anticipating public opinion and moving to meet adverse opinion swiftly, before it has had a chance to grow. It might be described as fire prevention as opposed to fire fighting. The public relations program transmits the company's story in a factual, informative manner, so that the customer knows his company, appreciates the service it is offering and recognizes that everything possible is being done to perfect that service and still keep costs low.

Pacific Gas & Electric Co. was a pioneer in the use of motion pictures as a public relations device, and has been gratified by the success it has enjoyed through that medium. PG&E has been first or second every year in the last decade in the annual competition among utilities for the best films produced.

The company first went into the movie business 30 years ago, when the motion picture industry itself was in infancy. The first efforts, in the early '20's, were 35-mm black-and-white sequences of company construction projects near the Pit river, in northern California. These sequences were photographed for the company by a professional cameraman engaged for the purpose, and were assembled with maps and other explanatory material to be shown principally to stockholders and company personnel.

The cost of producing 35-mm films for industrial use proved to be virtually prohibitive, however. The more lavish productions of Hollywood soon became almost sole users of the size, as it became evident that a big "box-office" was requisite for the high production expense of 35-mm movies. Eventually 16-mm and 8-mm equipment was developed, and PG&E found that 16-mm offered more economical production and wider distribution potential and that it was altogether feasible as a tool for industrial use.

It was in 1935 that PG&E first began to explore motion pictures as a medium for public relations. The next year,

Behind Your Electric Switch was produced to tell the story of generating and distributing electricity. PG&E's publicity department wrote and edited the script and directed the filming; a commercial studio supplied cameramen and technical knowledge. The picture was shown at the California state fair that year, and later was distributed around the company system with such marked success that the possibilities of motion pictures as a public relations medium were well established.

PG&E Goes Hollywood

In the same year, PG&E produced three silent films which were narrated at each showing by the person operating the projector. These three movies were the first steps in a plan to film one picture for each of the company's 13 geographical divisions, showing the utility's contribution to agriculture, mining, industry, and commerce in the different areas. It was the plan to show each film only within the division in which it was made. The popularity of the pictures changed that, however, for it was learned that the lumbermen in the north wanted to see the industrial activity of the cities, and the fruit-packing operations in California's valleys were interesting to coastal residents.

In 1937, with the success of four company films behind it, PG&E went into movie-making in earnest. The company's own full-time movie cameraman was employed for the first time, and great saving in production costs was made possible thereby. A commercial studio charges from $200 to $600 per day for shooting "on location," with the cost varying with the amount of lighting, sound equipment, and special effects equipment required. In addition, the costs of writing, editing, film cutting, etc. are high; in color work, exacting weather conditions are necessary. Movie cameramen may camp on the site for several days waiting for proper weather or atmospheric conditions. Meanwhile, the daily location charge continues in effect, in addition to the costs of travel and lodging.

PG&E's Jon F. Stanton, who has been with the company since 1937, is a member of the advertising and publicity department. He has done all the camera work on all of the PG&E movies since he joined the company, working full time on movies and occasionally helping out on still photography in rush periods. PG&E owns the equipment (including lighting), carries Mr. Stanton on its regular payroll, provides his expenses for field work and furnishes a laboratory and cutting room. These costs are normal expenses in the advertising and publicity department.

Thus, PG&E's only initial movie-making charge is for film stock. Scripts are written and perfected by the publicity staff; Mr. Stanton cuts the film to fit and the department supervises narration recording. It selects a narrator for the film and pays him an established standard fee for the job.

A commercial producer is used only to match and record sound, cut the master color stock to fit the black-and-white workprint, run off the color prints, and accomplish certain special effects. Even if the salary of the cameraman and a prorata of the publicity department expenses were charged against a picture, the estimated cost to PG&E would be but 20% of the same movie produced commercially.

The company produced two movies in 1938, the first of a long series of successful efforts. These were *Blossom Land*, a story of agriculture in the San Jose region of California, and *Sierra Playground*, a description of the company's public service policies in water conservation and fish and wildlife preservation. The latter film was the most popular ever produced by PG&E, and remained much in demand until its retirement last year. It was replaced by a new film on the same subject shown in February of this year: *Sierra Fish and Game*.

The latter movie was previewed before an audience of San Francisco fish-and-game editors, who acclaimed it in their Bay Area newspapers as one of the finest films on sport fishing ever produced in California.

Angling Angles

Fortunately for the company's motion picture-making program, Mr. Stanton is himself a fishing enthusiast who takes his camera along on frequent angling ventures. As a result, the three years of work that went into *Sierra Fish and Game* included some sequences that would have been almost impossible to achieve with a high-cost, non-fishing commercial motion picture company. There is, of course, the matter of luck, too. Like fishing itself, photography of wildlife is dependent on patience and perseverance — and being on the right spot at the right time.

By 1940, PG&E's motion picture-public relations program had furnished solid proof of the worth of such an undertaking. Subject matter, treatment, and approach were welded into products that were acceptable to almost every audience. Today, the success of the PG&E film program is an accepted fact. Older films have been retired and new replacements have been made; there are 12 current films being distributed, with several prints of each available. Extra prints of a movie, once it has been produced, are negligible in cost. Prints of a 30-minute color and sound film, for example, are obtainable for about $150-$175 each.

PG&E owns 20 sound-equipped movie projectors and screens, with each division having at least one. Several operators are on hand in each division. These men are chosen carefully from a public relations point of view, and are capable of doing an excellent PR job themselves when they visit service clubs or civic groups to handle the screening of a film. Booking of the films is supervised by a full-time employee in the company's publicity department. She books 88 prints from her office currently, at a rate averaging about 600 per month. The University of California's educational film library permanently retains 12 PG&E films, which it books heavily for school audiences throughout the state.

PR Movie Standards

Last year, PG&E produced and released three movies: *Snow*, *Kilowatt Builders*, and a documentary story of the 1949 Junior Grand National Livestock exposition. A 1950 version of the Junior Grand movie was released this year and a new construction movie is now in production. The company has found it can afford to make three or four movies each year, using its own personnel for the camera work, script-writing, editing, and cutting, and using a commercial studio only for sound and special effects. PG&E can produce at least three 30-minute movies under this method of operation for the cost of one half-hour film produced by a commercial studio.

The costs involved are only well invested when the standards of showmanship, photography, objectivity, and entertainment remain high, of course. Maintaining these standards is mainly a common sense problem: the subject must be of interest to the general public, there should be educational value, the "commercials" must be honest and inconspicuous (the PR movie is no place for the "heavy sell"), and the presentation must be in good taste. On the other hand, there must be sufficient public relations value in the subject to justify the expense of producing the picture and distributing it.

Keep Them Short

The films are shown to church groups, women's clubs, farm organizations, labor unions, schools, service clubs, Boy Scout troops and often in community-wide meetings. One point that deserves attention is the length of the films. They should not exceed a run of 30 minutes and preferably not more than 25. This is about the maximum time allowance

for movies if they are to be booked on the "creamed chicken circuit"—the service club luncheons where a program is desired, but where time is limited and there is other business to be considered. These luncheon groups are highly desirable audiences, since their membership usually includes leaders of the community.

Schools provide excellent audiences for industrial films and the movie is one of only a few means of telling the private enterprise story to school children. As long as the subjects are educational in nature and objectively presented, industrial films are acceptable in schools.

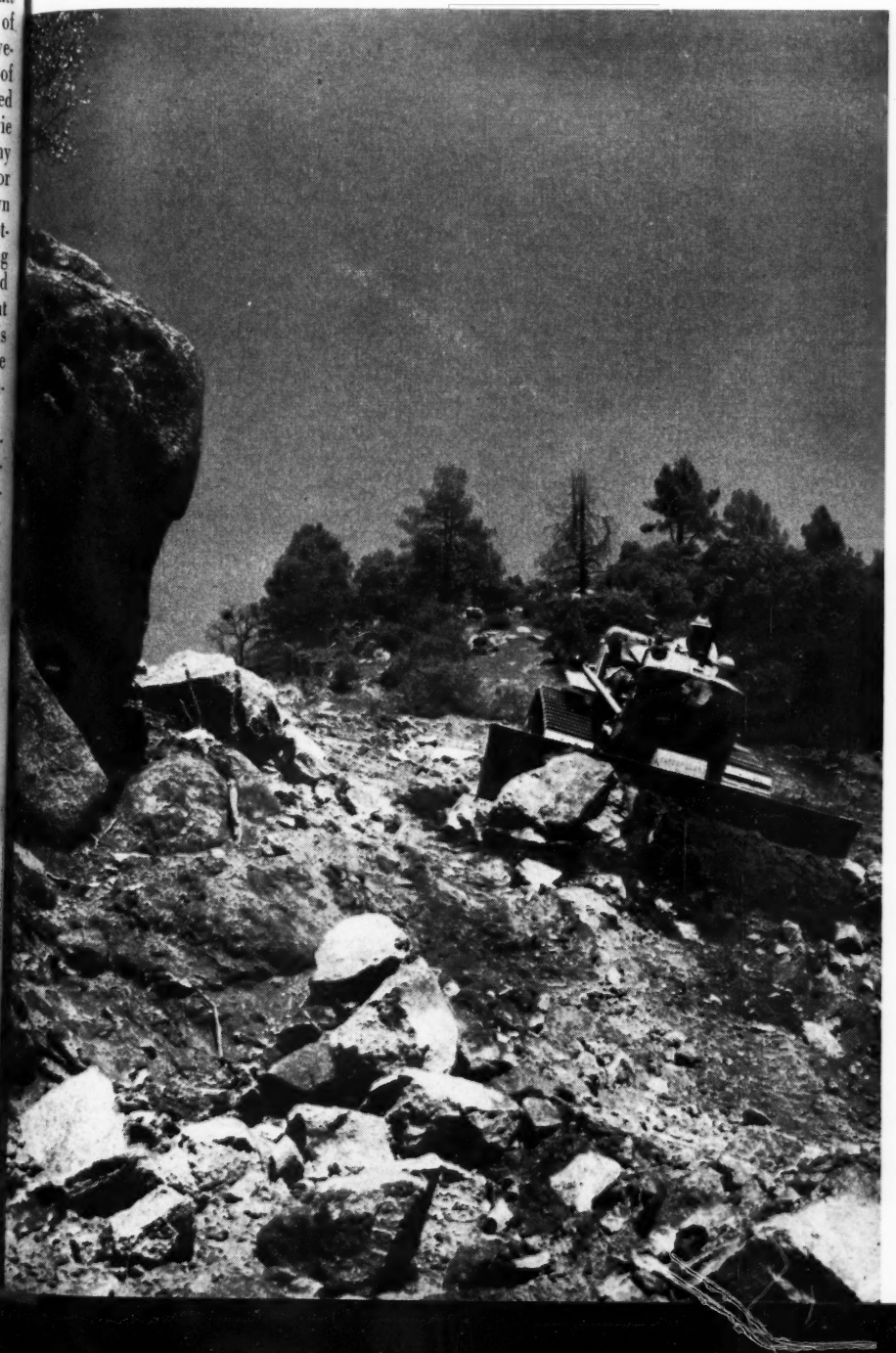
The appeal of PG&E films has not stayed at the local level, however. The U. S. State Department has shown interest in some of the pictures as an aid in explaining American industry abroad, and has exported PG&E's story in this manner. San Francisco TV stations have shown most of the company's films at one time or another on programs presented "in the public interest."

Two of PG&E's most successful films are *The Miracle Flame*, which the company produced for the Pacific Coast Gas Assn., and *The PG&E Super Inch*, released this year, which portrays the laying of the big line from Texas to the Bay Area and which has been acclaimed by many as the best film the company has ever produced.

It is obvious, of course, that motion pictures can't carry the public relations ball for a utility without all the help that other media can give. Newspapers, radio, billboards, direct mail—all have their place in the public relations program. Motion pictures are not as massive in appeal as some of these other media. The number of persons in a given community that attend the clubs and other groups for whom the pictures are shown is comparatively small, and the company is confined to "low-pressure selling" if it expects its movies to gain wide acceptance.

The solid value of the motion picture as a member of the PR team remains apparent, however. Just the fact that, on a first-come-first-served basis, the company supplies projector, screen, operator, and film free to any recognized group or club is a PR action of worth. Furthermore, there is a bonus in movie-making that is realized by the glamor and sparkle of the operation. Whole communities feel "on the inside" when a picture is made in their areas, and everyone is eager to see, understand, and help. Then they come to see the finished product, hear the company story and serve as critics by filling out brief questionnaires on the film distributed to every audience.

A good yardstick of the program's worth is the booking record. This year more than half a million persons will have seen PG&E films in audiences within the company's service territory. They were in a dark room for 30 minutes each, and all they could see or hear was what PG&E wanted to show them and tell them. That is an ideal circumstance for presenting a public relations message.



BULLDOZER chews into earth on Super Inch pipeline construction job—as seen in PG&E's sound movie telling the story of the big line.

Cooperative Film Producing

PG&E is a large company, and it can support its own movie-making operations. The big utility is not the only utility that can successfully apply the motion picture to its public relations problems, however. It is indeed feasible for five or six or even ten small companies to join in a movie-making effort on a subject of value to each. In this case, a commercial studio should do the job. The cost of a 30-minute color and sound film, which would run between $30,000 and $50,000, could easily be absorbed by a number of companies, each paying part. In such a situation, with extra prints available at low cost, each company could arrange to have its own title and introduction, so that within its own territory the film would appear as an exclusive production.

In summary, the motion picture, produced by the utility and used for employee safety or other training, or for a public relations medium to tell the company story better than any other communication can, has proved its mettle. It can't do the whole job, but what it does can't be duplicated by any other medium.

Storage Rating* + Recovery Rating* =

PERFORMANCE RATING

FOR AUTOMATIC WATER HEATERS

By C. E. BARTLETT

WHAT is hot water? If it were canned and sold over the counter like canned milk or canned soup, what would constitute the useful contents of the can?

Certainly not the water in it—no! No more than the water in the milk or the soup. What the can would really hold and what the purchaser would really buy would be the *heat* of the water which is in the can. Who, then, would ask for a pint can or quart can of hot water without knowing how much heat was in the can?

Therefore, a tank of hot water has a usefulness for housekeeping jobs in proportion to its temperature, no more, no less, and that usefulness cannot be expressed by the gallon content of the tank. A 30-gal. tank of hot water means only that it contains 6930 cu in. of water at some temperature. How much utility is in that water no one knows until the temperature is known.

For example, if a washing machine tub of 15-gal. capacity is to be filled with water at 140° and the water in the water heater tank is at 140°, 15 gal. would be drawn from the tank—no cold water used at all.

Should the water in the tank be at 160° and the cold water be at 40°, the hot water required to bring the 15 gal. to 140° would be 83%, or 12½ gal. of 160° water and 2½ gal. of 40° water. But if the cold water were 60° and the hot water 160°, then only 80%, or 12 gal. of hot and 3 gal. of cold water would be needed.

Thus, it will be seen that 20% more hot water at 140° would be needed than at 160°. If, therefore, the only job for hot water in that house at that time was to fill the washing machine, a 12½-gal. tank at 160° would do quite as well as a 15-gal. tank at 140°.

And if, for instance, one wanted bath water at 105° and had tap water at 160°, then the mixture of 13½ gal. of 160° and 11½ gal. of 40° water would give 25 gal. at 105°. But, if tap water was 140°, then 16½ gal. of hot and 8½ of cold would be needed.

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If the public can learn what to expect from canned milk, frozen fruit juices, canned soups, etc., why should we insult its intelligence by offering it a water heater with an open end specification in gallons or cubic inches without reference to the heat content?

Why such a fuss over tank size selling? Are not millions of water heaters in use which have been sold on tank size ratings? Yes, of course. And are not those most genuinely concerned with the welfare of the gas business shooting all the fireworks possible to get the selling side of the industry, utilities, plumbers, dealers and builders, to sell larger water heaters? Is not this cry for bigness an admission of inadequacy in past sizing of water heaters?

Would it not make sense first to decide what is a gallon of hot water? What temperature should the unit be, so that a 30-gal. water heater may be known as 30 *work-gallons* or *service-gallons*, from which point accurate estimates of service can be made?

Since all hot water stored is hotter than the human hide can work with or even endure in long contact, it follows that all hot water from an adequate water heater must be mixed with cold water except when used with mechanical or automatic washers.

With automatic and non-automatic washing machines being sold in such volume and with the many new homes built with washers as original equipment, is it not reasonable to assume the temperature which is required for a washer as the minimum necessary temperature for the home?

This temperature is 160°. It is requested by makers of washers; it is recommended by domestic science laboratories of reputable institutions of collegiate grade; it is used in commercial laundries, recommended by Consumers' Union and makers of some of the best known soaps and detergents.

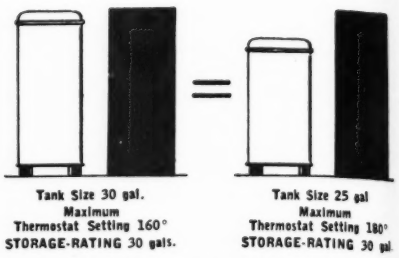


Fig. 2. Storage rating may remain the same for tanks of different sizes and varying thermostat settings.

Everyone who has seriously investigated this subject testifies to the truth of the slogan—"The Hotter the Water the Whiter the Wash."

There are some dissenting voices which object to setting 160° as the standard of measurement for a hot water gallon. The opposition generally bases its fear on excessive radiation loss with consequent high gas bills, accelerated corrosion of galvanized steel tanks, or on excessive wear and tear on piping, brass work, and washers on hot water lines.

These objections are easily answered. If 160° water is not always in demand, the thermostat can be adjusted to 125° or 135° or any degree desired, and turned up to 160° when needed. If a steel tank coated with zinc or other linings or coatings cannot take 160° water,

***Storage Rating = Thermostat setting measured as a percentage of 160° (standard hot water gallon unit) x tank size.**

***Recovery Rating = Btu input per hour x .83 (Btu required to raise 1 gal. 100°).**

there are available various treatments for the tank to help resistance to rust; and there are tanks made of metals which are unaffected by most waters at any temperature. As to wear and tear on the system and faucets, Consumers' Union suggests an inexpensive mixing or tempering valve for hot water lines, except those leading to the laundry or sinks where higher temperature water may be used.

Certainly it is true that if higher temperature water is needed for modern appliances, it will be forthcoming. No fatherly forbidding of 160° by any agency will stop it.

A water heater, then, is satisfactory if it can supply sufficient hot water at right temperatures for peak demands. If it can take care of the peaks it can easily handle the valleys. It would seem reasonable to suppose that a peak demand in domestic use would not last longer than one hour. The water heater may have a tank big enough to handle the entire peak or it may have a smaller tank with a faster recovery.

So, if a 30-gal. water heater signifies 30 gal. at 160°, then a 30-gal. tank at 140° is equal only to 24 gal. at 160°, and 30 gal. at 180° is equal to 36 gal. at 160°. (See *Fig. 1.*)

This, of course, is old stuff, but clearly rating each water heater is not old. It has always been possible but seldom used.

Assume that a 30-gal. water heater contains 30 gal. of water at 160° ready for the one-hour peak demand. It might, therefore, be given a storage rating of 30 gal. If it were a 25-gal. heater at 180° it would also have storage rating of 30 gal. (See *Fig. 2.*)

For example, to determine the storage rating of a water heater with a maximum thermostat setting of 140°, multiply its tank size by 80%; for a setting of 180°, multiply by 120%.*

To this 30-gal. storage rating should be added the recovery rating. This recovery rating has always been in plain sight, but needs translation. On a gas water heater it is indicated by the Btu input per hour. In an electric water heater it is shown by the kwh.

Heretofore, recovery has been expressed as gallons heated per hour through a 60° rise. Most informed people think this is not realistic. Next year AGA ratings will be on the basis of 100° rise. This means that using 60° as the average initial temperature, 160° is the final or stored temperature, as suggested above, and the proper unit for service-gallon storage measurement.

*It must be remembered that incoming cold water temperature is a factor in the thermostat setting. In determining storage ratings, this factor or average (here considered to be 60°), must be subtracted throughout. So a 140° setting becomes 80° and the 160° hot water gallon unit of measurement becomes 100°—or for a direct percentage comparison, 80% and 100%. The percentages when multiplied by a given tank size result in the storage rating.

To find this recovery rating, simply multiply the Btu input (in thousands) of gas water heaters by .83.** The answer is the gallons per hour heated 100°, or to 160° from the yearly average of 60°. (See *Fig. 3.*)

A 30-gal. gas water heater with 10,000-Btu input would have a storage rating of 30, a recovery rating of 8.3 gal. per hour of 160° water, giving a performance rating of 30 plus 8.3, or 38.3. This is about the slowest water heater listed in the AGA Approved List. A more usual 30-gal. gas water heater with a 25,000-Btu input would have a performance rating of 51, a 30 storage rating plus a 21 recovery rating.

A fast 30-gal. gas water heater of 35,700-Btu input would have a performance rating of 60, a storage rating of 30 plus recovery rating of 30. (See *Fig. 4.*)

Here are three 30-gal. water heaters. With the usual selling patter all three would rate equal—just 30-gal. heaters! Yet from a work or service standpoint, alone, there is a difference of 21.3 gal. as between 38.3 and 60. The latter is 56% more efficient!

Electric water heaters also have their performance ratings. Conceding a performance of 100%, which is 10% too high, figure 4 gal. at 100° rise for each

**This figure is a mathematical equivalent derived from the AGA specification that it requires a maximum input of 1190 Btu to raise 1 gal. of water 100°.

Fig. 1. Effect of thermostat setting on storage rating for tanks of the same capacity.

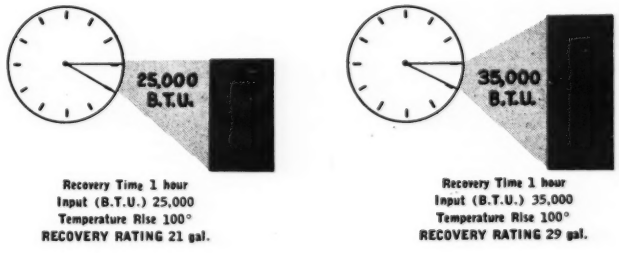


Fig. 3. Effect of hourly input on recovery rating.

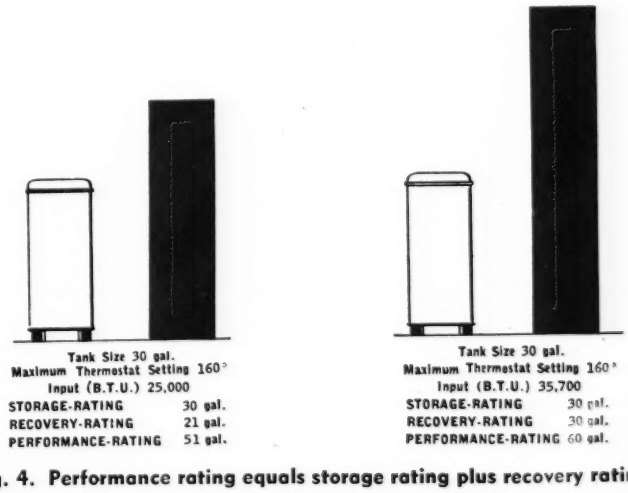


Fig. 4. Performance rating equals storage rating plus recovery rating.

Recovery-Rating of automatic water heaters.

Electric—INPUT—Gas (Watts)	(B.T.U.)	Recovery-Rating (Gal., 100° Rise)
1,000		4
1,500		6
2,000		8
2,500		10
3,000		12
3,500		14
4,000		16
	20,000	17
4,500		18
5,000		20
	25,000	21
	30,000	25
	35,000	29
	40,000	34
	45,000	38
	50,000	42
	55,000	46
	60,000	50
	65,000	55
	70,000	59

NOTE: Ratings shown for electric water heaters are the theoretical maximum attainable. They assume a heat transfer efficiency of 100%, and also assume that both upper and lower elements are "on" during complete reheating cycle. Actually, the upper element comes "on" only when incoming cold water reaches the approximate level of the element. Further, in a typical "off-peak" type of installation, a time clock prevents use of the lower element during peak-hours, thus further reducing the theoretical Recovery-Rating.

Note: Input data usually appears in plate on jacket.

PERFORMANCE · RATING: Minimum Recommendations.

Number of Bedrooms	1	2	3	4	5	6
With No Automatic Washers	40	45	55	75	85	95
**Automatic Clothes Washer Only*	55	55	65	85	95	105
Automatic Dishwasher Only	45	50	60	80	90	100
**Both Types Automatic Washers*	60	60	70	90	100	110

*A—Although a recommended minimum Performance-Rating of 55 is shown for one- and two-bedroom homes having an automatic clothes washer, it is recommended the 55 Performance-Rating include a minimum Recovery-Rating of 30 gallons. In cases where the automatic clothes washer handles more than three successive loads, a minimum Recovery-Rating of 35 gallons is recommended.

B—In warm climates where inlet temperatures ordinarily do not drop below 60° F. a minimum Performance-Rating 10% under that shown should provide satisfactory service.

C—In homes where there are very short runs of tubing or small diameter pipe to kitchen and bathroom outlets, a Performance-Rating slightly lower than recommended may prove satisfactory. Conversely, long runs or large sizes of pipe will necessitate an increase in Performance-Rating.

kwh. A 30-gal. electric with a storage rating of 30 and an input of 1600 watts, or 1.6 kwh, has a recovery rating of 6.4 gal. per hour. The addition of 30 gal. storage results in a performance rating of 36.4. This is less than that of the slowest 30-gal. gas water heater rated 38.3, and slower by 15 gal., or 29%, than an ordinary 25,000-Btu gas water heater, and by 24 gal., or 40%, of a relatively fast gas water heater.

Has Gas Got It? Put it another way. To equal a 30-gal. gas water heater with a performance rating of 60 would call for an electric water heater of at least 50 gal. and an input of 2.5 kwh. And, after the first hour, should demand continue, the little 30-gal. gas water heater would continue to serve up 30 gal. of hot water at a 100° rise, while the electric would be putting only 10 gal. into its 50-gal. tank.

Moving up to larger demands, a home with four bedrooms, two baths, a kitchen, and a laundry with an automatic washer might well be served with a gas water heater with a performance rating of 85. One with a 45-gal. storage rating and a 50,000-Btu input, giving a recovery rating of 42 would swing it comfortably. An electric heater of this rating would require an 80-gal. tank and an input of 1.5 kwh, or a 66-gal. tank with 4-kwh input would neatly do it. But, again, the recovery after the peak would be, for gas, 42 gal. per hour, for electricity, 6 or 16 gal., depending upon whether the input was 1.5 kwh or 4 kwh.

In any comparison of gas water heaters with competition it is well to consider how much time elapses between the peak hours. A gas water heater with storage and recovery ratings substantially equal could handle a peak hour every other hour; the "bucket-a-day" coal stove every five to twelve hours, depending upon its firing rate; the usual oil "summer-winter hookup," every three hours; and the electric, with usual element equipment, every five hours. All these estimates are made with the provision that no hot water is drawn during the recovery period. And, in figuring the electric water heaters' recuperation, the input recommended is frequently higher than is permissible under a special water heater rate, either "off-peak" or even unrestricted as to time.

Washing machines, both dish- and clothes-, are now demanding higher water temperatures. The estimate for 1950 was for more than 3 million new "home laundries." This, says the *Wall Street Journal*, contrasts with the 300,000 sold by Bendix, alone, from 1937 to 1941 and the 600,000 sold in 1947. Today there are, according to the same source, 27 other makers who will have a share of 1950 sales.

For dish-washing machines the estimate for 1950 was 250,000 and the industry is just beginning. One enthusiastic maker claims for it a market second only to television.

These machines cannot work with low-temperature water. They want *hot water*. And *hot water* does not mean "protected" tanks; it means tanks which do not need protection. And tanks like that mean water heaters of real quality and prices in accordance with it. Gas water heaters with their high performance ratings and fast recuperation will have, in the market of the future even more than now, not only a higher comfort and service potential but also a definitely better selling position than any possible competition.

Gas has not only got "*It*"—it's got "*Them*."

GASCO ROAD SHOW BOX-OFFICE HIT IN OHIO

By MARY E. HUCK

When the 10th annual AGA home service achievement awards sponsored by "McCall's" were presented last fall in Atlantic City, Mary E. Huck, general home service director for The Ohio Fuel Gas Co., Columbus, received the top Division A award: for outstanding accomplishment in the home service department of a gas utility employing more than three persons.

In this article, she relates her experiences in planning and staging Ohio Fuel's traveling cooking school which reached 61,466 Ohioans last year. Mimeographed reports, available from the company, give a more detailed story.

Last month Miss Huck and several members of her department presented a part of the cooking school program to attendants at the AGA Home Service Workshop in Washington, D.C.

IF you can't bring the audience to your show, take your show to the audience. That maxim, which has inspired the professional theater to send out road companies on the summer circuit, has also influenced the home service department of the Ohio Fuel Gas Co., Columbus, to take its own shows "on the road."

Exclusive

Ohio Fuel's particular production, a traveling cooking school titled, "Gasco Food Institute," bids fair to hang up some new records for number of continuous performances.

The institute was the logical answer to our problems, which are common to home service departments in other large utilites with extensive properties: limited home service personnel and inadequate facilities for properly demonstrating the superiority of gas to half-a-million customers in 360 widely separated communities. Our 47 home economists often have neither the time nor the facilities to plan elaborate demonstrations. Many towns are not large enough to justify a full-time home service girl and many of our offices are too small to provide adequate kitchen facilities for demonstrations.

For several years before the war we carried on a very active cooking school program throughout the state. However, during the war and the gas-emergency years following these schools were discontinued. In the fall of 1949 we resumed the Gasco Food Institute on an even larger scale than any we had previously sponsored. This school, complete in every detail, was planned during the summer months in cooperation with the advertising, publicity and dealer promotion departments. The institute then was ready to leave the main office in October and travel throughout the winter and spring months, presenting two- and three-day cooking schools in all of our properties.

The 1950 Gasco Food Institute was set up to meet three important needs of our company:

1. Create good will and good public relations.
2. Increase gas load through increased interest in cooking.
3. Increase the sale of gas appliances.

The personnel of each unit included a home economist to serve as food lecturer and a manager chosen from the advertising department. The food lecturer was responsible for presenting the demonstration and contacting participating dealers. The manager was in charge of the physical setup of the school, which included conducting the prize drawing and supervising setting up the demonstration kitchen. To make her better known, the local home service adviser assisted on stage and took some part in the actual demonstration.

Basically a cooking school, the institute might also be thought of as a show. Special costumes, stage props, and recordings, combined with modern gas ranges glamorously displayed in a New Freedom Gas Kitchen, all contributed to the overall effect. To adequately cover our territory we had two complete units, each including an automobile and trailer, complete kitchen setup, stage properties, cooking utensils and display dishes.

The kitchen and all the equipment were carried in a specially designed trailer (see photo).

The kitchen, which was built in units so it might be easily dismantled, measured approximately 25 ft across the front, 9 ft high, and about 8 ft deep. Every effort was made in planning the kitchen to have it one which would have eye-appeal, show off the appliances to advantage, serve as an efficient demonstration kitchen, and yet be practical

enough to be within range of the average homemaker (see photo).

Both side walls were built at an angle to the back wall, which permitted maximum visibility. Two gas ranges and the gas refrigerator had prominent spots in the kitchen and were used to capacity at all times. Mirrors were used over each of the ranges and the table to show cooking and meal preparation.

Two special display tables equipped with mirror and turn-table top, were used at the end of each demonstration to show the finished foods glamorously. The demonstrator could turn the table, place the food on it, and then turn it around for the audience to see. By having two of these tables it was easy for one display to be shown while the second was being set up.

Backstage Props Speed Show

We incorporated an idea in the display tables which to my mind made the cooking schools move along much faster than any we had ever given. One of the problems in displaying food is carrying it in on a tray and then setting it up with the proper accessories and garnishes under the mirror. To speed this up we had a set of plywood trays with chrome handles which would just fit under the display mirror (see photo).

In addition to the demonstration kitchen on stage, a temporary work kitchen was always set up backstage. With the exception of the range and the refrigerator, all equipment used in the advance preparation was carried as part of the standard trailer equipment. Folding tables and shelves were built on the back wall of the demonstration kitchen and extra tables were carried to provide additional work area as local conditions permitted.

To save space backstage a collapsible rack for holding the display trays—similar to a bakery rack — was designed. When the racks were set up, the display trays could be stacked one on top of another with approximately a foot between and the display dishes and cloths arranged before the demonstration started (see photo). This meant, then, that whenever the foods were finished on stage they could be brought out and immediately set up for the final display.

A water tank was attached to the back wall of the kitchen to provide running water in the front demonstration kitchen sink. This gave us an opportunity to tie in our automatic gas water heater story. Ordinary trunks were used for carrying the cooking utensils and display dishes. The wire drum used in the prize drawing as well as the amplifying system were also standard trailer equipment.

For variety and extra color, the cast wore dresses of different colors on all three days. Both the traveling food lecturer and the local home service adviser, who served as an assistant, wore matching dresses. Because the assistant changed from town to town it was necessary for each unit to carry all of the dresses in several different sizes.

Local newspapers were asked to cooperate with the gas company in sponsoring the Gasco Food Institute. The newspaper, in accepting sponsorship of the cooking school, was responsible for running two pages of advertising at its expense while we guaranteed two pages at our expense. The newspaper was also asked to secure the auditorium or theater in which the institute was held. The gas company took care of all other expenses connected with the cooking school.

The newspaper also worked with us in soliciting advertising and prizes from local dealers and merchants. Any cooperating dealer was asked to give a sizable prize and if at all possible to advertize the cooking school. Some companies worked with us on a state-wide scale. Their products, including mixers, pressure cookers, dishes, cooking utensils, sets of thermometers, and apples from the Ohio Apple Institute, were used in each of the demonstrations and given as prizes. Prizes and dealers were limited to those products or organizations which would naturally fit into a cooking school. By working in many of these local "commercials" it was easier, and seemed much less selfish, to re-emphasize time and again our product—gas. The entire demonstration was made to seem like a community project.

Special shopping bags inscribed with the Gasco Food Institute insignia were available for the cooperating grocers who gave away foods. Usually 10 to 12 bags of groceries were given away each day along with flowers, bakery products, dairy certificates, utensils and dishes. Some of the other prizes included a place setting of sterling, a year's rent in a frozen food locker, service for eight in silver plate and meal tickets from hotels.

Dealers' Role

Dealers handling CP gas ranges were invited to participate. They loaned the ranges to be used on stage during the demonstration, bought newspaper space to promote gas for cooking, and shared the cost of the range that was given away as a grand prize. Inasmuch as two ranges were in continual operation on the stage each day, as many as six CP gas ranges were demonstrated in our three-day schools. The promotion was limited to CP ranges only.

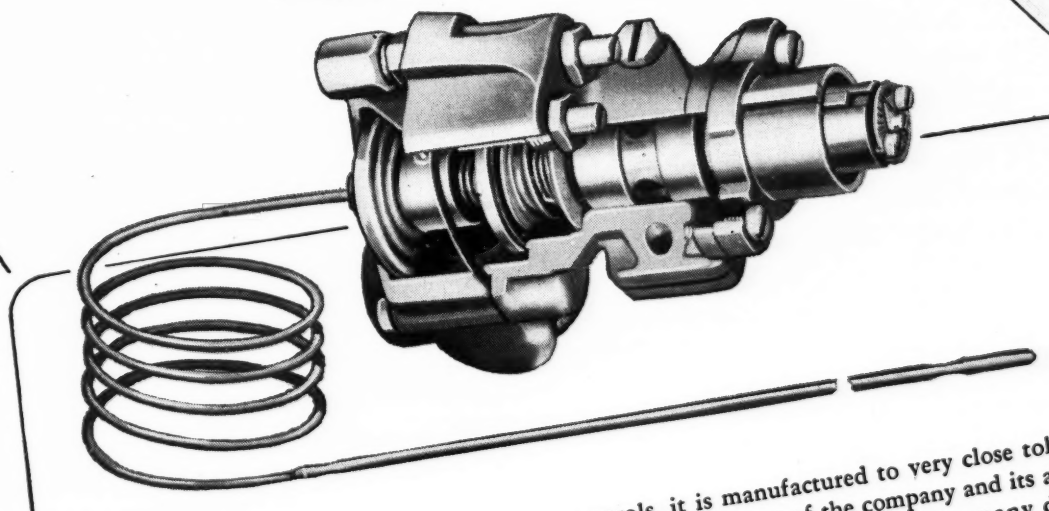
The range which was given away on the final day of each school was selected by a drawing and the cost of the range was divided among the cooperating dealers. Wherever possible the gas range dealers who had participated in the school were asked to come to the stage to be introduced to the crowd and assist in the drawing. Dealers, too, served as ushers along with gas company salesmen.

The winner always had to be present to receive the prize, except in those instances when we turned crowds away from the door. On the tickets used in the drawing was space for the audience to list type and age of present appliances. These tickets were used after the cooking school for prospect lists for both gas company and dealer salesmen.

Having the school in so many different areas made it necessary for the demonstration as well as the advertising and publicity to be organized very carefully. The publicity department prepared all of the publicity stories and pictures

HERE IS THE portable "rose garden" kitchen used in the 1950 Gasco Food Institute productions. Color scheme is centered around wallpaper with large pink roses on a dark green background. Cabinets are pink, and the wall at left is pale green.

IT'S MADE GOOD 12,000,000 TIMES OVER



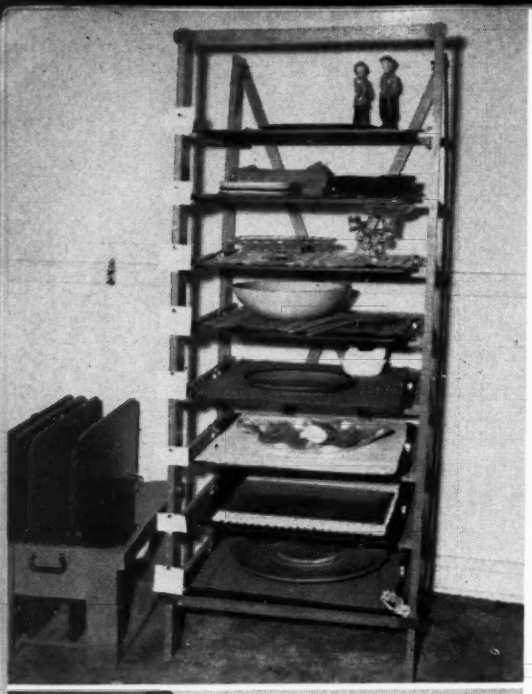
Well over 12,000,000 Model BJ Thermostats are now successfully meeting the requirements of America's outstanding gas range manufacturers. These requirements call for an accurate, sensitive oven-heat-control, rugged enough to retain its precision for years.

Precision Made Like all Robertshaw controls, it is manufactured to very close tolerances. The great resources of the company and its ability to provide accurate precision tools, many designed especially for individual needs and exclusive to the Robertshaw plant, insure this high precision so necessary to every step of production. These facilities are unmatched within the industry.

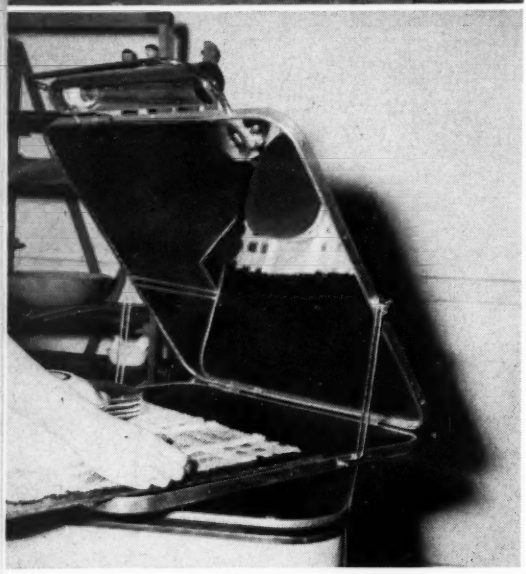
Robertshaw-Fulton
CONTROLS COMPANY
GREENSBURG · PENNSYLVANIA

In Home and Industry Everything's Under Control

Robertshaw Thermostat Division, Youngwood, Pennsylvania • Grayson Controls Division, Lynwood, California • Fulton Sylphon Division, Knoxville, Tennessee • American Thermometer Division, St. Louis, Missouri • Bridgeport Thermostat Division, Bridgeport, Connecticut



COLLAPSIBLE rack was used backstage to hold display setups. Dishes and cloths were arranged before demonstration started. At left are display trays and rack for stowing them.



DISPLAY MIRROR and tray used for carrying garnished foods on stage saved many awkward moments and sped up the flow of action. By using the tray, which slides in under the mirror, food and accessories could be arranged on display cloths backstage, then carried in and quickly slipped into place.

which were sent to the newspaper in advance of the cooking school. The advertising department supplied advertising mats for both the gas company and newspaper ads. Handbills were distributed well in advance of the institute by the gas company and other cooperating dealers. We couldn't advertise free prizes in our newspaper ads or publicity, so we emphasized these on both the handbills and window posters.

Each demonstration was written in detail so that local home service advisers would have a complete blueprint of what each day's school included. Portfolios were made up by the home service department in our main office and sent early in the fall to each district adviser. These portfolios included scripts of demonstrations, market orders, kitchen plans, instructions for advance preparation, time sheets, tray setups, display charts, etc.

At the end of the summer all home service personnel was brought into the main office for a two-day meeting at which time the Gasco Food Institute was presented in full and instructions given for soliciting prizes and handling other details of the school.

Food Limitations

Each recipe used in the demonstration was selected to show off some special advantage of gas cookery and dramatize the features of CP ranges. We tried to keep the foods reasonable in cost, yet different enough to be interesting. One of our problems in selecting foods for this type of a demonstration was limited selection of foods in some of our smaller communities. The practicality of our demonstration was emphasized by the fact that our market order for a three-day school included only ½ pint whipping cream!

The theme for the first day of the cooking school was "Food Fashions in Review." The general idea of this day was taking old-fashioned recipes and bringing them up to date through modern methods of cooking and modern gas appliances.

Pie, being one of grandmother's favorites, played an important part in this day's demonstration with the demonstrator showing a new method for making pastry and a special recipe for an old-fashioned raisin pie. At the end of the demonstration a baked Alaska pie was shown as a 1950 food fashion. Naturally this was an excellent opportunity to give a good story on oven insulation as well as on the frozen food compartment of the Servel. This recipe was one of the most sensational of all.

Other foods used on the first day were a complete oven meal to show capacity, a ham baked the modern gas way with low-temperature roasting, and an old-fashioned stew brought up to date in the pressure saucepan. A broiler meal was set up to show broiler capacity and even browning, and a tossed green salad played up the vegetable crisper of the Servel. A spiced jelly roll wth a caramel filling was made to show the even browning over a large area of cake.

On each demonstration, the institute manager was given a role which added a touch of humor. On the first day we had the manager, dressed in a chef's cap and apron, prepare broccoli, using an old-fashioned cook book. This, of course, created a lot of interest and fun for the audience. After the manager had cooked the broccoli in a large kettle of boiling water, the local home service adviser showed the modern method of cooking vegetables using a small amount of water and the simmer flame. Naturally the difference in color and texture was quite dramatic and left an impression on the audience. For the 1950 touch, the home service adviser then dressed up her broccoli with cream of chicken soup and grated cheese and broiled it to demonstrate again the even browning of the broiler.

The second day's theme was "Adventures in New Freedom Gas Cooking." All foods used on this day were based around the idea that any housewife can have, with modern gas appliances, new kitchen freedom.

The third day of our 1950 Gasco Food Institute was called "Cooking Carousel." This was probably one of the prettiest days of the school because foods were selected as those which would give the audience a merry-go-round of ideas for entertaining. A recording of merry-go-round music opened the show while the institute manager, dressed as a circus barker, came strolling down the aisle carrying multi-colored balloons to which were tied the "Gas Has Got It" potholders. As he tossed these out to the ladies in the audience he went through a regular barker routine.

With everyone in a party mood the lecturer went immediately into a demonstration of inexpensive yet glamorous dishes. Oven meals, broiler meals, one-dish meals, and glamorous refrigerator dishes all helped create the party atmosphere as well as show off the gas appliances. Merry-go-round music again played in the background as the cooking school came to an end.

We were highly pleased with the results of our first year's institute. Forty-one schools were held with an attendance of 61,466. Of these, 10 were two-day schools and 31 were three-day. It was interesting to note the increase in attendance during the three days which the school was in town. In some cases the crowd doubled each day. In many towns we had a full house on the first day and turned crowds away on the last day. We had some morning schools, especially where they were held in theaters, and the remainder in the afternoon or evening. We were particularly interested in noting the composition of the audience at the various schools. The evening schools attracted more men and more of the younger women. For this reason, this year we are holding night schools wherever possible. Many working women have requested evening

Out Of This World...
ROPER
"America's Finest Gas Range"
A Complete Line of Scintillating New 1951 Roper Models
An Outstanding New National and Local Advertising Program that's Powerful... All Inclusive

schools and many young mothers can have husbands baby-sit at night in cases where it is impossible to pay a baby sitter for several afternoons.

As I mentioned earlier, one of the purposes of the cooking school was to increase interest in cooking and thereby increase the consumption of gas. It was for this reason that the recipes were selected for their practicality and displayed as attractively as possible so that women would want to go home and try them. After the cooking schools our home service advisers made home calls on 615 customers who had attended. We found that almost all had tried several of the recipes.

In one town the local hardware store completely sold out all its cake pans because the women wanted new pans before attempting the cake. Perhaps this will have some effect on baking complaints in that area! In another town the crowd coming home from the cooking school completely exhausted the supply of pork steaks at the local grocery. All were hurrying home to try out the corn stuffed pork which we had demonstrated.

Sales Traced to School

It is hard to measure the direct results of the Gasco Food Institute in terms of dollars and cents. We are confident, though, that the cooking schools contributed greatly to the increased interest in and sale of gas appliances.

In one town five Servels were sold immediately following the institute as a direct result of the prospects' having attended the cooking school. In another small town a dealer, selling seven ranges and seven Servels in 1949, sold eight ranges and three Servels in the three weeks following the cooking school. The ranges which were used during the demonstrations in several instances were sold before the audience left the auditorium. In another town, in the seven days following the school our company sold nine ranges, seven of which were CP.

As a result of the food institute more and more dealers are requesting the services of our home economists for home calls and sales floor demonstrations. Several dealers have reported a decided increase in sales since the institute. In one town a customer reported that she had bought a gas range which she had never heard of before seeing it demonstrated at the cooking school.

Not too many of the dealers in our area have made a practice of handling CP gas ranges. By limiting the school to only those who did, we created an interest in upgrading gas ranges. Many dealers who did not have CP ranges last year made plans to handle them so that they can benefit by participation in the school this year.

The good will which the Gasco Food Institute created has without a doubt been outstanding. Again it is a result of the cooking school which we can never measure. However, we cannot help but believe that in each of the towns in which the institute was presented we left a much stronger tie between our customers and the gas company. Of the 615 home calls which we made following the school, all but one were complimentary.

Many of the women in attendance sent thank you notes or letters to the food lecturers after the cooking school had left town. Some even included small gifts.

In all cases where we held the Gasco Food Institute in high school auditoriums home economics classes were invited to attend the cooking school and, if the teacher wished, the class was taken backstage to be shown the preliminary preparations that are needed to present a cooking school. We felt that the results of doing this more than justified the time spent. From remarks that we have heard from home economics teachers as well as superintendents, we have learned that the trip was instrumental in creating added interest not only in home service but in general home economics training. In one instance the supervisor of the cafeteria insisted that all of her cafeteria employees attend the last two days of the cooking school because she felt they would learn many new food techniques.

One of the most interesting sidelights of the institute was a nursery school which was conducted by a home economics class during the days on which the institute was held at the school.

THE GASCO Food Institute is on the road again in 1951 with an entirely new show. Below is one of the advance notices run in co-operation with local newspapers.

TOMORROW
LAST DAY
OF THE
gasco
FOOD INSTITUTE
1951
The blue flame and cinderella...
is the theme for the last cooking school in this community.
The demonstration will show you how modern economical gas appliances
can be your knight in shining armor ... how they can make your kitchen a
fairyland of beauty and convenience. Fancy salads, party menus and eye
appealing desserts are the order of the day. If you attended other sessions
of the cooking school, we know you'll be on hand tomorrow ...
it promises to be the best yet.
FOOD INSTITUTE CLIMAXES WITH A BIG, BIG SURPRISE!
Food Institute climaxes with ..... a big, big SURPRISE!
don't miss tomorrow!
conducted by
THE OHIO FUEL Gas Company
in cooperation with The Daily Globe
free admission to all

The publicity which we received for all the schools was very good. Most of the publicity articles were those which we had sent out from our office. However, many of the papers sent photographers to take pictures of the crowd and to get special write-ups of the demonstrations themselves. One newspaper prepared a special edition of its weekly paper to publicize the Gasco Food Institute and delivered it to everyone in the marketing area of the town.

The institute was also most instrumental in building up a more friendly relationship between local merchants and the gas company. In several towns hotels and restaurants cooperated by featuring some of our recipes while the cooking school was in town. In another area the recipes were featured a week after the cooking school. Most dealers ran ads in conjunction with the school and others tied in with window displays.

We felt that the prizes, too, built up considerable good will in the communities. The winners themselves have done much to promote the gas company in each town.

The local home service advisers have noticed increased home service activity since the institute. Although we have an active home service program and one which is fairly well publicized, it was interesting to note the number of customers who did not know our home service advisers or realize the wide scope of our program.

In most towns all company employees were asked to publicize the cooking school. Meter readers gave out handbills and, whenever possible, personally invited each customer to attend. Likewise cashiers in the pay periods before the institute reminded the customers that the institute was coming. This helped to make it not a home service project, not an advertising promotion, but rather everyone's cooking school.

The 1950 Gasco Food Institute was an expensive project and one which took more time and effort than any of us ever dreamed possible.

1951 Show Bigger Than Ever

The 1951 Institute, which started on the road in October, is an entirely new show. There are new problems, too. With the equipment situation as it is today, we've found it necessary to set up a pool of CP ranges in our main office for use throughout the state. Now to the original car and trailer we have added a truck and small trailer to haul the ranges.

We feel, however, that regardless of the problems, the Gasco Food Institute cannot be discontinued at this time. In fact, we have done everything possible to make this year's school an even bigger promotion than the 1950 Institute.

FIRING BRICKS WITH GAS

Increased speed, improved quality, new color tones, economical use of space achieved by conversion from coal

By ROBERT G. HARTMAN

SINCE natural gas has replaced coal in three kilns of Alliance (Ohio) Clay Products Co., firing cycles are reduced, brick quality is improved, a variety of colors is obtained, and additional yard space is available for brick handling and temporary storage.

The Alliance firm is one of the largest face brick producers in the world. From its 24 kilns comes a large assortment of brick of many kinds, types and sizes.

During the late months of 1949, the Natural Gas Co. of West Virginia, a part of the Pittsburgh Group of the Columbia Gas System, was asked to suggest ways and means to adapt kilns to natural gas. This gas company was called in because of its exploratory work in gas conversion with the Summitville (Ohio) Face Brick Co.

The public utility and the Alliance brick producer decided to work on two kilns at the start. If successful results were secured, other kilns would be converted. The gas company was to make the actual installation of gas-burning equipment which the brick producer could purchase after the testing period.

The kilns of the Alliance Clay Products Co. are rectangular, with interior dimensions of 70 ft by 24 ft. Each kiln has 20 firing mouths and 10 draft stacks.

The natural gas installation consists of a 3-in. high pressure North American inspirator burner with flame-retention nozzle, mounted at a 45° angle in each firing mouth. The 20 burners per kiln are connected to a common manifold of 3-in. pipe. Gas is received into this manifold through one 3-in. plug-type valve.

This valve is in reality a single control for all 20 burners. However, small valves were placed on each burner line for convenience in lighting and as an emergency measure should any kiln get out of heat balance. Experience proved the practicability of the single valve recommendation as nearly all firing has been done through this control.

The first two converted kilns were lighted on Nov. 2, 1949. Firing results were very pleasing. Some of the kilns showed as high as 95.3% first quality brick. The balance was good saleable product.

Firing cycles with coal were from 5½ to 6 days. Natural gas firing cut this down to 3½ or 4 days firing. The gas-fired kilns are reported to be much cleaner than ever before. Brick quality is said to be improved by the uniform heat and close firing control.

Another attribute claimed for the conversion to natural gas is the ability to change the color of the brick by varying firing conditions. Brick that ordinarily would be red was fired for a few hours under a reducing atmosphere. This actually reduced the surface of brick until it became a glossy black.

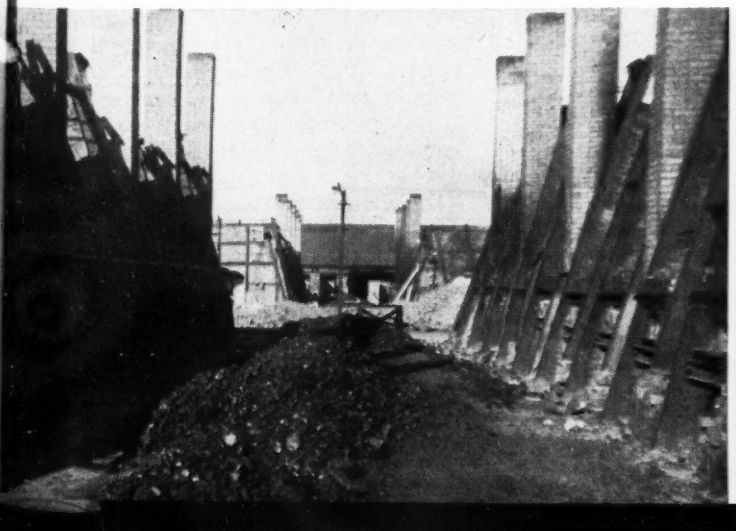
Other testing revealed that Alliance Clay Products Co. can use natural gas to produce many artistic colors on the brick. It has been able to produce almost any combination of colors, or mingles, by specific placement of the brick in the kiln, coupled with the desired firing atmosphere. The brick maker reports a most sensitive firing atmosphere is easily obtained when natural gas is utilized in the kilns.

The question of securing economies in fuel bills was dominant when the company started the experimental conversion to natural gas.

Actual fuel costs with natural gas varied from 9700 to 11,800 cu ft for firing 1000 bricks. These costs are based on producing a standard size face brick with an average weight of 4¼ lb, which was fired to temperatures between 1950° and 1990° F.

Mr. Hartman is industrial engineer for Natural Gas Co. of West Virginia at Salem, Ohio.

BEFORE Alliance Clay Products Co. converted these kilns to natural gas, the alley between kilns was always littered with ashes, as shown below.



HERE IS one of the face brick kilns after conversion to natural gas. Note large area available for handling and temporary storage of bricks.

Industrial Incinerators

their design has been changed to include a secondary combustion zone for complete burning — eliminating venting of air-polluting substances and odors to the atmosphere

By LAWRENCE TARICCO and ROBERT H. REID

PROGRESSIVE industrial expansion has resulted in increased air pollution to such a marked degree that national attention has been focused on the problem of controlling airborne waste. Pollution products take many forms, but in particular nearly everyone has seen smoke rising from an incinerator stack or been assailed with nauseous industrial odors at one time or another.

This increased awareness of pollution problems and their restrictions has led to the application of improved equipment and technique to incineration for the disposal of combustible wastes.

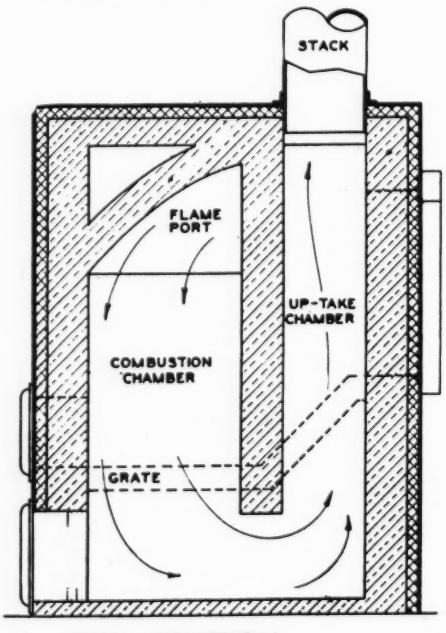
Incinerators generally have one characteristic in common and that is they are all charged in a manner which leads to the following conditions: Hearth charging of bulk material gives a smothered fire which throws off incompletely burned products. Overhead charging permits the convection currents to lift some light material before it reaches the flame. These various incompletely burned products escape from the combustible heat of the fire before they can be completely burned. Under normal use, the old-style industrial incinerators with single stage burning permit these products to escape to the atmosphere.

In incinerators of recent design a secondary combustion zone has been provided to allow space, sufficient time, and air for the effluent gases and entrained solids to burn completely before escaping to atmosphere. In some of the more difficult applications the effluent products do not contain sufficient heat to warm up the refractories and provide for heat loss without falling below combustion temperatures. Therefore it is necessary to provide an auxiliary source of controlled heat in the secondary combustion chamber to obtain effluent temperatures sufficiently high to insure complete combustion.

In fact, even where the heat balance is favorable to burnerless incineration, it is a distinct advantage when starting a cold incinerator to have the additional source of heat which will more readily warm up the secondary zone refractories, minimizing the possibility of start-up smoke. An additional feature of the higher temperatures is the promotion of coalescence and fusion of fine incombustible particles, which normally cannot be settled to sizes and shapes capable of being trapped in the incinerator. Where noxious gases of an organic origin have been introduced, they are broken down to unobjectionable products.

The necessary auxiliary heat is supplied through the medium of a gas flame imposed across the direction of the waste stream flow. While considerable heat is transferred by conduction and convection, the fact that a luminous flame possesses a degree of radiant heat emissivity superior to that of a blue flame is of material consequence here. A simplification of incinerator design can be achieved through the use of a luminous flame because it gives an increased amount of effective direct radiant heating of effluent solids, water vapor, carbon dioxide, and carbon monoxide so that it is not necessary to bring these effluents into physical contact with the flame or its products.

INCINERATOR shown in side view below was built for Wilson Packing Co. (Los Angeles) by Bilt-Rite Incinerator Co. Inc., also of Los Angeles.



END SECTION

Refractories Radiate Heat

This flame and its products of combustion also heat the secondary zone refractories to practical radiant temperatures so that they in turn heat the aforementioned products from the primary zone. The products will heat the balance of the gases with symmetrical molecules by conduction to a degree in accordance with their respective concentrations. It can be readily seen that radiant heat absorption by the waste gases becomes more of a factor where the materials charged possess an unusually high moisture content leading to an increased water vapor concentration.

A different approach might be that the auxiliary fire heats the refractories and furnishes the heat lost to atmosphere so that no cooling of the products from the charging chamber takes place.

Mr. Taricco and Mr. Reid are associated with The Mettler Co. Inc., Los Angeles. Story courtesy the Pacific Coast Gas Assn.

How *Caloric*® "chain-reaction" selling builds your gas range *PROFITS*

One out of five Ultramatic Caloric Gas Range sales is the result of neighbor-to-neighbor recommendation. Authentic records confirm this fact year after year. And this "chain reaction" selling has put Caloric way ahead in preference—made it the Gas Range women *ask for* if they don't see it on display.

Of course, word-of-mouth recommendation is only possible when a range has proved superior value, as Caloric certainly has. Women everywhere are enthusiastic about its exclusive features—and especially the fact that Calorics are *America's Easiest Ranges to Keep Clean.*

CALORIC STOVE CORPORATION
Widener Building, Philadelphia 7, Pa.
Exclusively Gas Range Manufacturers

Strongest National Advertising in Gas Range Industry

No "Johnny come lately" to national advertising, Caloric for years has backed up its dealers with a complete promotional program, recognized as the strongest in the gas range field.

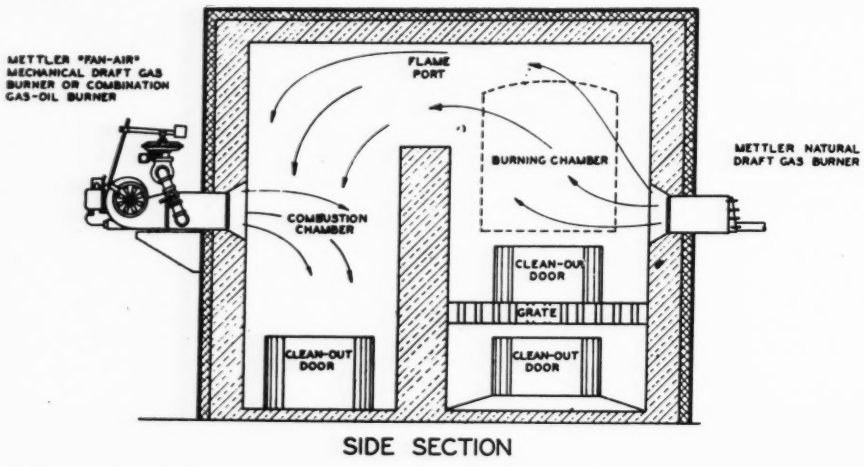
More than 200,000,000 selling messages will go out during the coming year through the pages of 16 national magazines, directed specifically to the prospects right in your community. This is pre-selling that you can actually *see* paying off in your Caloric sales month after month.

Ask your Caloric Representative more about it.

CP TRADE MARK · C.A.M.A.

REPLACEMENT OR REFUND OF MONEY
Guaranteed by Good Housekeeping
IF NOT AS ADVERTISED THEREIN

Ultramatic *Caloric*® Gas Ranges
America's Easiest Ranges to Keep Clean



WILSON PACKING incinerator embodies secondary-stage combustion principle, employs a Mettler No. 13F-R assembly "C" Fan Air burner in the secondary zone. Forced draft burner was chosen because it has high radiancy, luminous flame, automatic features.

A combination gas-oil burner may be used to provide a standby oil fire should the use of gas be subject to curtailment.

Air introduced in the secondary zone through air induction ports properly located assures ample excess air for combustion.

Material Dictates Design

Considerable variation of incinerator design is possible according to the material being handled. Heat of combustion of the material being charged is of prime importance. A proper heat balance will show the amount of auxiliary heat needed to maintain combustion temperatures throughout the incinerator. Where noxious vapors are charged, no practical heat of combustion is assigned them. The manner of charging, whether in bulk or in air suspension from a cyclone settler, is another factor. The ratio of particle surface area to its weight not only affects particle entrainment but rate of heat release as well. The material's rate of flame propagation is still another factor. We will not elaborate on these factors here as we are now primarily concerned with presenting the principle of secondary combustion.

It would be well to point out here that the position of the secondary zone burner in the effluent path plays a very important part in its effectiveness.

Outstanding Example

An outstanding example of an incinerator embodying the second stage combustion principle was constructed for the Wilson Packing Co.'s Los Angeles plant by the Bilt-Rite Incinerator Co., employing a Mettler No. 13F-R Assembly "C" "Fan Air" burner in the secondary zone. This forced draft burner was chosen because it combines a high radiancy, luminous flame with desirable automatic features. When the burner is turned on at a remote switch located near the charging door, it starts automatically with electric spark ignition of the pilot. A flame rectifier pilot incorporated in the burner shuts off the gas in the event of pilot extinguishment or power failure. When the burner shuts off, the air register closes keeping surplus cold air out of the combustion chamber.

The "Fan Air" burners are adapted to automatic process control where proportioned fuel gas flow is desirable. For direct smoke control, a photo-electric-actuated relay installation can be made across the waste gas stream near the base of the stack. Direct waste gas temperature control can be obtained through the use of a thermocouple in conjunction with a potentiometer.

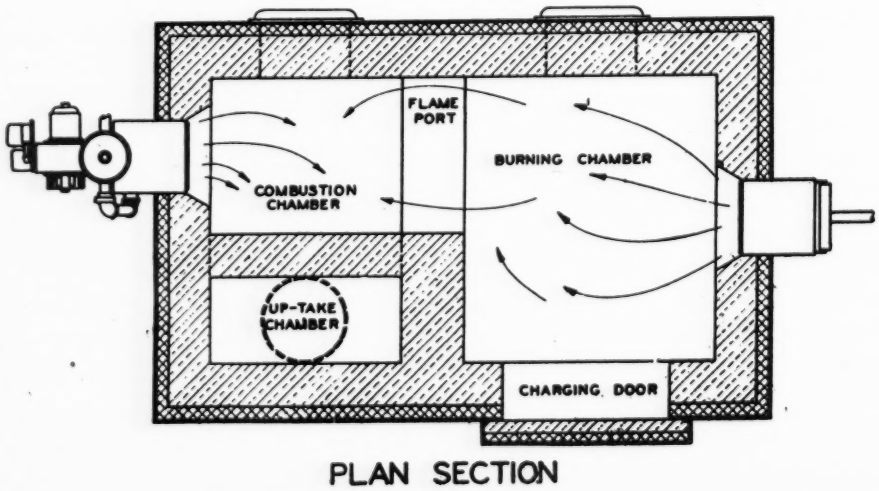
The Wilson Packing Co.'s incinerator was designed to burn 600 lb per hr of waste material (sawdust, wood, paper, etc.) and 350 cu ft per minute of waste vapors from a fat rendering process, all of which are introduced into a burning chamber in the presence of a natural draft Mettler No. 9 kindling burner.

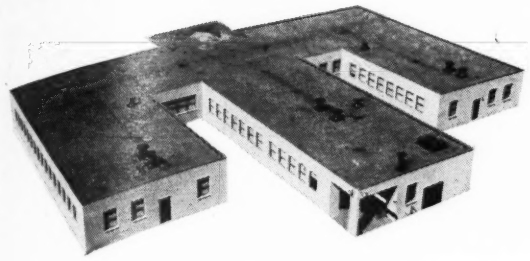
Complete Combustion

Gases and solids rising from the burning chamber are drawn off through a high sidewall flame port and swept down across the forced draft, luminous gas flame which introduces about 750,000 Btu per hr in a combustion chamber. In this zone the effluent products are maintained at temperatures of from 1400° F to 2000° F varying with the load. Here complete combustion and the full breakdown of the fat rendering process vapors are insured. At the same time the incombustible fines tend to coalesce and fuse to shapes and weights possessing better settling characteristics. The downward flow in the combustion chamber facilitates the precipitation of fly ash which is removed occasionally through a clean-out door. Other clean-out doors and air induction ports are provided in critical locations. From the combustion chamber the products pass under a low arch into an uptake chamber and thence into the stack.

This incinerator and others embodying the principle of secondary stage combustion have been very successful in the field. They have satisfactorily eliminated black smoke and combustible solids from their stacks, complying with local air pollution regulations. The new design also provides an effective means for disposing of noxious gases of an organic origin such as those commonly found emanating from fish canneries, meat packing houses, and tanneries.

WHEN BURNER is turned on at remote switch located near charging door, it starts automatically with electric spark ignition of pilot. Flame rectifier in burner shuts off gas in event of pilot extinguishment or power failure. When burner shuts off, air register closes, keeping surplus cold air out of combustion chamber.





Aerial view of United Gas Corp.'s new research laboratory.

Important Advances in Technology Promised in United's New Research Laboratory

A sound investment in the future—that's what the United Gas Corp. has in its recently completed research laboratory in Shreveport, dedicated to the betterment of gas service in the "Gulf South."

In eight functional labs and four smaller units for special projects is the heart of United's accelerated research program. One unit each is devoted to physics, research chemistry, electronics, chemical engineering, research p-v-t (pressure - volume - temperaure), development p-v-t, production chemistry, and development.

United has good reason to believe it has one of the finest physical setups for research in the nation. Into its construction went features borrowed from the best labs in the country, uncovered by the staff in personal inspection tours that ranged from California to Massachusetts. Not easily satisfied, United's scientists incorporated some new ideas of their own.

The result is a layout that is simple, flexible, and functional, permitting a wide variety of projects to be carried on simultaneously.

As soon as equipment had been assembled and arranged, the chemistry section plunged into work on four projects: the development of analytical methods to determine very small amounts of uncommon metals in salt water, intended to show whether two wells produce from the same sand; search for methods to determine the amounts and kind of acids derived from petroleum to gain new information for correlating formations and to help in the broad study of petroleum's origin; a study of the natural radioactivity of well cores to help correlate the various geological formations; and a search for means to chemically control unwanted vegetation along rights-of-way.

The physics section was also starting on a study of the flow of fluids through porous media. Methods of computing the time which elapses during pipeline blowoffs were also being sought.

Electronics personnel undertook to develop instruments to more accurately determine bottom hole pressures and temperatures and transmit the information to the surface, and to find tools for detecting pipeline leaks by acoustical methods. An instrument to detect very small amounts of water vapor in high pressure gas was another objective. One of the most important studies in this department was the application of telemetering and remote control by using carrier currents on wire telephones lines and on microwave radio relay links.

In chemical engineering, staff members were attempting to devise a method to dehydrate absorber oil, another method for reducing dust in pipelines.

In the p-v-t sections, a broad program was under way to obtain the fundamental pressure-volume-temperature relations in hydrocarbon mixtures, along with allied projects.

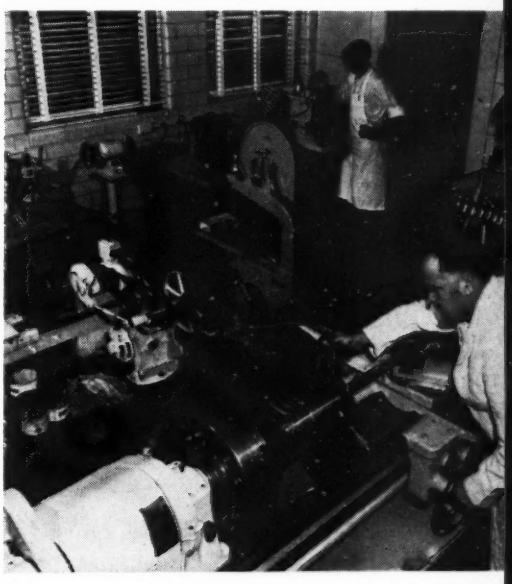
The building abounds in unique equipment and construction features. In p-v-t, for example, is an "all-windowed cell," which enables the scientist to see changes take place, just as they would beneath the earth's surface, as he studies underground phenomena.

Most unusual room is the electronics laboratory, shielded from outside interference (which might affect the operation of delicate, sensitive equipment) with copper foil in ceiling, floor, and walls.

Exposed piping is eliminated by the use of movable transite partitions. Air conditioning is closely controlled for health and comfort, for the proper operation of sensitive instruments, and as a safeguard against accumulations of toxic fumes. The building is fireproofed and well supplied with fire-fighting aids and safety devices.

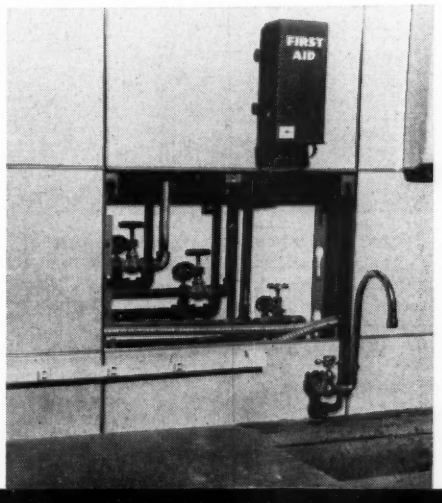
More than half of the building's 14,500 sq ft is devoted to research. It also houses a library and administrative offices. At the rear is a 100-ft antenna for electronic research.

D. T. MacRoberts, as head of United's research program, is responsible to see that this "investment in the future" pays real dividends for United and its customers—and, for that matter, the entire gas industry.



Machine shop where special equipment for research projects is designed and fabricated. J. B. Hays, machinist, in the foreground, and D. O. Monette, laboratory assistant.

Close-up of service piping in one of the lab rooms, showing removable access panels.



NEWS

Manufacturers

Pittsburgh Valve Firms Bought by Rockwell

In a $3-million cash and stock transfer negotiation, Rockwell Manufacturing Co. last month acquired the Pittsburgh Valve & Fittings Division of the Pitcairn Corp. and the Pittsburgh Valve & Fitting Corp., a Pitcairn subsidiary.

Manufacturing facilities and main offices of Pittsburgh Valve are in Barberton, Ohio. Many improvements to the property have been made during the past three years, and the 38-acre tract includes a modern, mechanized foundry for the manufacture of valve castings. Rockwell also acquired company-owned warehouses in Kansas City and Houston. Leased warehouses are maintained in Chicago and New York.

The Barberton plant will be operated as one of Rockwell's meter and valve divisions under the direction of L. A. Dixon, vice president. R. G. Caouette, general manager in charge of manufacturing for the meter and valve division, will be general manager at Barberton. To handle sales, Pittsburgh Valve's J. A. Strachan, general manager of sales, all district managers, and a staff of 25 will remain in their former positions.

U. S. Steel Readies New Producing Facilities

A new steel plant which will have capacity to produce 1.8 million ingot tons a year and extra manufacturing facilities at two existing plants are part of the current expansion program planned by U. S. Steel Corp. and subsidiaries.

To get under way this spring, and scheduled for completion by the end of 1952, the steel plant near Morrisville, Pa. will be named the Fairless Works. Finished products are expected to start rolling out of the plant within 6 to 12 months after construction begins. National Tube Co., a subsidiary, will install facilities at the new site for producing standard pipe.

At Gary, Ind. National Tube will install a large extrusion plant for the manufacture of high alloy seamless specialty tubes, as well as shapes and bars. A 2500-ton hydraulic extrusion press and related facilities will be housed in an existing building.

Geneva Steel Co., another subsidiary, has announced plans for installing facilities at the Geneva, Utah plant to increase steel production capacity by 160,000 net tons. The expansion program is expected to require about a year.

General Controls Builds Midwestern Branches

Midwestern locations have been selected by General Controls Co., Glendale, Calif., for two new operations—a factory and warehouse at Skokie, Ill. and a factory branch sales office in Indianapolis.

The Skokie site is a few miles north of Chicago, and construction of the factory-warehouse is scheduled to begin early this year. Although General Controls maintains 24 branch offices, including the new one in Indianapolis, the Illinois factory will be the only location other than Glendale which is equipped for manufacturing.

Richard H. Weber has been named to manage the Indianapolis branch, which will be under the supervision of the Chicago office.

Newsnotes

Every Dresser Manufacturing Division employee with at least one year's service with the company is now a stockholder. Departing from the usual custom of presenting each employee with a $10 Christmas check, this year the company distributed 594 shares of common stock, one to a person. Employees with less than a year's service received a $10 check.

FOUR PITTSBURGH area gas companies —Equitable, Manufacturers Light & Heat, Peoples Natural, and T. W. Phillips—are sponsoring a new daily TV show demonstrating techniques of modern gas cookery. Titled "Kay's Kitchen," the show features Miss Katherine M. Neumann, of Ketchum, MacLeod & Grove Inc. Time- and energy-saving methods of preparing, cooking, and serving food are presented in an up-to-the-minute gas kitchen.

U. S. Pipe & Foundry Co., Burlington, N. J., recently acquired complete ownership of Pontusco Corp. which it formerly owned jointly with Compagnie de Pont-a-Mousson of Nancy, France. Pontusco holds all the common stock of the United Concrete Pipe Corp. of California. The agreement included acquisition by the French company of Pontusco Corp. of Cuba, which produces concrete pipe at El Cotorro, Havana.

Factory officials and field sales personnel from all parts of the country met in Jackson, Mich., Dec. 27-29 for the annual sales meeting of the Timken Silent Automatic Division of Timken-Detroit Axle Co. The conference was directed by T. A. Crawford, general manager of the division and a vice president of the parent company, with the assistance of C. A. Cooper, assistant general manager, and R. M. Marberry, advertising manager.

Manufacturers of products finished in porcelain enamel may purchase, for about $4 per 1000, three-color labels identifying the finish as "genuine porcelain enamel—the lifetime finish." The Porcelain Enamel Institute, 1010 Vermont Ave., N.W., Washington 5, D. C. produces such labels and reports that more than 500,000 of them were distributed during the first nine months of 1950. Two limitations are placed on use of the label by the institute: the user must certify that products are finished in genuine porcelain enamel, and labels must originate from the institute. Membership in PEI is not required, however.

To fulfill a new government contract, Cribben & Sexton Co., Chicago, has purchased a factory and office building, auxiliary

FORTY KEY representatives, including personnel from a number of Surface Combustion Corp. Janitrol offices as well as direct contract agents, attended the fifth annual sales and engineering conference of Webster Engineering Co., Tulsa. L. S. Reagan (front row, extreme left), vice president and general manager of Webster, acted as convention host and presided over the Jan. 4-6 sessions. The three-day program included basic and advanced engineering sessions and discussion of pricing trends and management problems.

Bryant Model 322 Unit Heater with A.G.A. inputs of 110, 135, 175, 210 thousand Btu per hour.

How to cut maintenance *Overhead*

Best bet for industrial or commercial heating installations on your lines is *the* unit heater you can recommend on the basis of *least maintenance*. That's where your customer looks for long-range economy and lasting satisfaction.

Tell him of the trouble-free operation of Bryant Gas Unit Heaters . . . how their specifically designed unit heater controls eliminate failures . . . how proper heat exchanger design prevents burnouts and squeezes a maximum of heat from every dollar's worth of fuel . . . how simple, timesaving installation of these Bryants meets his needs for comfort heating that's quick, automatic and without waste.

And, once installed, he can count on these Bryant Unit Heaters for fewer service calls . . . less trouble *overhead*. These advantages mean *savings* for him . . . customer satisfaction for you.

For a more complete story, contact the Bryant Distributor nearest you or write direct. Bryant Heater Division, Dept. 281, Affiliated Gas Equipment, Inc., 17825 St. Clair Ave., Cleveland 10, O.

Let the pup be furnace man
. . . and water boy, too!

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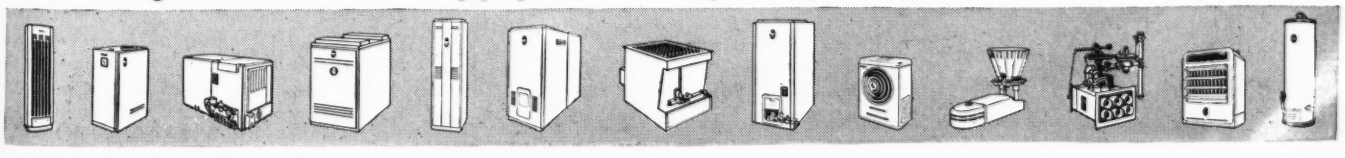
Your *single source* of supply for everything in gas heating equipment!



Additional space for production of Metal Rim diaphragms for gas meters is provided in this factory annex to the Lancaster (Ohio) Meter Parts Co. plant, which also houses offices and a lab.

Cooperation of gas company superintendents, foremen, and engineers has been instrumental in the development of this line of diaphragms, according to Karl Schaus, owner and general manager. They are made of New Zealand lamb skins attached to substantial metal rims and are jigged to very close tolerances.

Elimination of the knot in the cord which fastens the leather pocket to the outer metal rim flange prevents puncturing of the leather by the knot, and another advantage claimed is the removal of wrinkles around the outer metal rim, giving smoother meter action.

buildings, and railroad sidings on a 40-acre tract near Michigan City, Ind. The plant was formerly owned by Stefco Steel Co., producers of prefabricated steel industrial buildings.

Financial

Gascos Buck Inflation, Continue to Lower Rates

Inflation or no, many gas companies are still cutting rates. In fact, since the last report utilities that have sliced prices have outnumbered those that have boosted costs to the customer.

Late 1950 reductions were announced by several companies. The FPC accepted a revised schedule filed by Colorado-Wyoming Gas Co., Denver, which will reduce rates to its three wholesale customers by about $357,-032 annually. In Atlanta, the Georgia Public Service Commission approved a 36% reduction in rates to consumers in Athens. Atlanta Gas Light Co., which serves the city, was to make the reduction as soon as Athens was converted from manufactured to natural.

Arizona Edison Co., Phoenix, announced lower rates in four communities: Yuma, Yuma Valley, Ajo Heights, and Bowie. It was the second 1950 reduction for the first three towns.

A reduction amounting to $36,489 a year to consumers in the Clay county, Mo., area served by Central West Utility Co., Kansas City, was ordered in mid-January by the Missouri Public Service Commission. Average yearly saving per customer was estimated at about $10.

On the other side of the ledger, the Illinois Commerce Commission has reaffirmed an Aug. 16 order which authorized Peoples Gas Light & Coke Co., Chicago, to increase rates to industrial and commercial users by about .5 cent per therm. FPC Presiding Examiner Marvin Farrington filed an initial decision on Jan. 3 which would allow 83% of a proposed $2,046,647 annual rate increase by Hope Natural Gas Co., Clarksburg, W. Va. The order is subject to commission review.

In Toronto, gas users will find their bills higher after Feb. 1. Consumers Gas Co. has announced a 7½% increase. The rise was to have become effective Dec. 1 but was deferred at the mayor's request for examination of the company's books by the city auditor. The proposed increases were found to be in order.

Leo Carrillo, stage, screen, and TV star, and William A. Ray, president of General Controls Co., Glendale, Calif. are shown signing a contract for a television show which made its debut on Jan. 23. Looking on is J. F. Ray, vice president in charge of sales for General Controls, sponsor of the show.

Originating in Los Angeles and seen via kinescope in 14 other cities, "Leo Carrillo's American Diary" presents sketches of outstanding American businessmen and how the free enterprise system made it possible for them to become successful.

Texoma and Natural Merge

Late in December the Federal Power Commission approved Natural Gas Pipeline Co. of America's proposed acquisition of all facilities of its affiliate, Texoma Natural Gas Co. Both companies are affiliates of The Peoples Gas Light & Coke Co. and maintain offices in Chicago.

To offset the merger, Natural was to issue to Peoples 5000 shares of its no-par capital stock in exchange for the 10,000 shares of similar Texoma stock held by Peoples. The Texoma stock will be cancelled.

Financial Notes

Sale of Lea County (N. M.) Water Co.'s gas distribution system to Southern Union Gas Co. for $310,000 was approved recently by the Public Service Commission of New Mexico. Southern Natural will add the 35½-mile line to its network in the southern part of the state and will supply gas to local firms at Hobbs and Eunice.

Merger of Long Beach (N. Y.) Gas Co. into its parent, the Long Island Lighting Co., has been approved by the state public service commission. At the same time, the commission ruled that present interim gas rates of the Long Beach company are not producing excessive return on the property and should be continued. Long Island Lighting's entire rate structure will be reviewed after natural gas has been introduced into the system, the commission stated.

Load Building

Hartford Tops New England In Water Heater Sales

Hartford (Conn.) Gas Co. is allowing its sales department to take a bow: the company sold more gas water heaters last year than any other gas company in New England. The firm, with 65,000 meters on its lines, outsold companies servicing two to five times that number.

A powerful advertising and promotion program and active participation in the AGA's Court of Flame activities were cited as important factors in accomplishing the record.

Herb Hall, appliance sales manager, reports that 1503 water heaters were sold during the year. In addition, range sales for 1950 totaled 1251, more than any New England company of comparable size managed to sell.

AGA Research Probes Detonation Combustion

Experiments conducted under the AGA industrial gas research program have resulted in a new method of burning natural and other city gases through application of the principles of jet propulsion to stationary industrial heating.

By means of "detonation combustion" gas has been burned at such rapid rates that heat can be produced in a steel melting or heat

treating furnace much faster than the most modern equipment can accomplish. Such combustion is achieved by concentrating the heat of a rapid series of instantaneous explosions into a furnace, melter, or other apparatus, thereby enlarging its production capacity.

Consultant on this AGA-sponsored work is Dr. John J. Durin, of the University of Toledo physics department. Experimental detonation burners known as resonant rotary port burners have been built to interpret and produce these high heat releases. The work is being carried on at the Surface Combustion Corp. laboratory in Toledo.

McCall's Kitchen Contest Promotion Opportunity

Gas appliance manufacturers who advertise in the March issue of *McCall's* will be cashing in on a big promotion built around the magazine's "My Kitchen" contest to be announced in that issue.

The contest itself will be announced in two, four-color double spreads. AGA has planned a four-color kitchen and laundry ad with a contest tie-in, and this ad will refer to pages on which gas appliance ads appear. The AGA ad copy will also mention brand names of advertisers.

The contest requires redesigning or remodeling an existing kitchen or designing a new one. Winners in three divisions—amateur, professional, and student—will receive 107 cash prizes. Special awards will be made for certain categories, one of which is the best all-gas kitchen.

RG&E Film in Demand

For the past year, a 16-mm Kodacolor sound film titled "Power and Progress in Rochester and the Genesee Valley" has been selling the Rochester, N. Y. area and Rochester Gas & Electric Co. to viewers.

Originally produced by General Public Utility Corp., RG&E's former parent, to present the company's merits and potentialities to prospective stockholders, the picture was cut from 40 to 26 minutes by eliminating the financial aspects.

The edited film has been made available to civic groups and was shown on Rochester's television station WHAM-TV. In addition, educational institutions all over the country have shown the complete film.

New Construction

Biggest Cat Cracker at Work for Long Island

Last month the largest catalytic cracking plant ever constructed for fuel gas production went into operation at Glenwood Landing station of Long Island Lighting Co. Transcontinental Gas Pipe Line Corp. will supply 25 MMcf of natural gas daily and the plant will convert it to 46½ MMcf of manufactured.

This plant—the second to be installed by Long Island—will supply a large portion of the gas distributed by the company. The first catalytic cracking unit was placed in operation to meet peak load demands in January 1948. (Described in *GAS*, April 1948, p.

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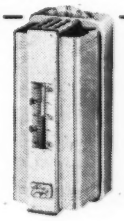
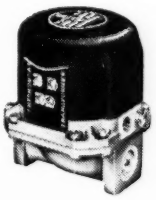
Facts you need–FREE!

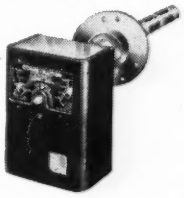
Just check space opposite equipment you're interested in, fill in your name and address and mail this column to us. We'll get your facts to you promptly.



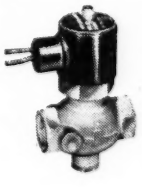
Dollar for dollar, the Honeywell TM81A Acratherm does the best temperature control job of *any* thermostat in the gas field. It's extremely simple to calibrate, set and adjust. The TM81A Acratherm controls *both* the On and Off cycles of the burner — a feature exclusive with Honeywell. Check here for additional information. ☐



Because of its low cost, the compact V898A Diaphragm Gas Valve is specially useful for conversions and for installation on existing burners. It comes with either a mounted or plug-in transformer – which makes it adaptable to almost all gas heating installations. Quiet, slow opening, and of standard width, it's designed for either left- or right-hand mountings. Specify if for L. P. Gas. Check here for further information. ☐



Highly sensitive and dependable, the LA401A Combination Furnace Control has an extremely rapid rate of response. In addition to especially easy-to-read settings, the LA401A features a linkage stop that makes it impossible to adjust the fan-on setting above the limit control. Check here for additional information. ☐



Rugged, dependable and low in cost, the Honeywell V835A Solenoid Gas Valve is the most popular control in its field. The metal disk on the valve seat practically wears forever. A hammer action type plunger and a sturdy centering disk assure operation under the stickiest of gas conditions. Specify if for L. P. Gas. Check here for further information. ☐

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY
Minneapolis 8, Minnesota, Dept. GS-2-06

Name_____

Firm Name_____

Address_____

City_____ Zone_____ State_____

52.) Both plants were designed and built by Surface Combustion Corp., Toledo.

Present manufactured gas production facilities of the company will be retained as standby equipment.

Newport Construction Will Almost Double Capacity

An estimated 96% increase in plant capacity is anticipated by Newport (R. I.) Gas Light Co. as a result of proposed expansion. The construction program will be financed by a bond issue, recently approved by the state public utilities administrator.

Improvements include a 9-in. gas set capable of producing 2800 Mcf of 1000-Btu gas daily (the company has been serving 510-Btu gas), a 525,000-gal. oil storage tank to hold oil required for the new high-Btu gas, a cooling scrubber, an 8-in. pipeline to carry gas from the new set to the relief holder, and a calorimixer.

When natural gas becomes available in Newport, the new equipment will be maintained for standby.

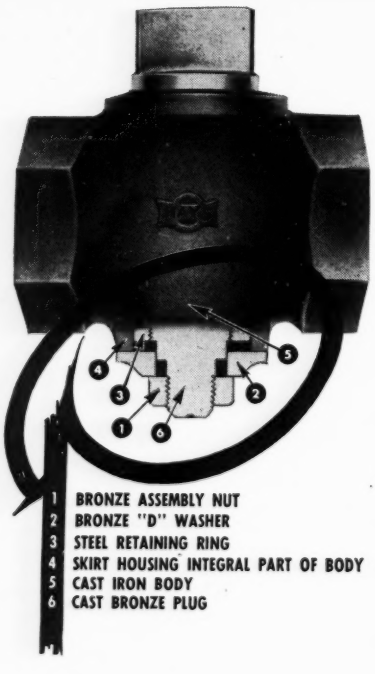
SoCal Plans New Offices

Expansion of its headquarters buildings and construction of a new branch are being planned by Southern California Gas Co., Los Angeles. Crowded conditions in the downtown main office may be relieved by construction of an adjoining structure. Architects are studying possibilities, and preparation of actual working plans will depend upon development of a satisfactory design and upon cost and economics of the project. In North Hollywood, a new customer's office—ultra-modern, including a Servel air conditioning system—was to be started Feb. 1 with completion scheduled for June 1.

HAYS®

TAMPER-PROOF GAS STOPS

FEATURES


1 BRONZE ASSEMBLY NUT
2 BRONZE "D" WASHER
3 STEEL RETAINING RING
4 SKIRT HOUSING INTEGRAL PART OF BODY
5 CAST IRON BODY
6 CAST BRONZE PLUG

- Tamper-Proof Design with Non-Removable Plug.
- Extra Grade Gray Iron Body, Gas Service Bronze Plug.
- Steel Retaining Ring Prevents Removal of Plug.
- Steel Retaining Ring Assembled to Bottom of Plug—Eliminates Possible Damage to Precision Ground Surface of Plug and Body.
- Steel Retaining Ring Threaded and Staked to the Largest Metal Diameter on Bottom of Tapered Plug—Assures Retention without Distortion.
- Steel Retaining Ring Anchored without Drill Hole or Pin—Eliminates Possible Shearing of Plug.
- Steel Retaining Ring Located below Shoulder of Body—Permits Freedom for Service Adjustment of Plug.
- Steel Retaining Ring Recessed and Inaccessible within Iron Body—Gripless and Shearless.
- Plug and Body Precision Ground and Matched for Perfect Seating.
- Individually Tested Under Rigidly Controlled Inspection.
- Lubricated with a Compound of Greases Suitable for Use with Manufactured, Natural or Liquid Petroleum Gases.
- Obtainable in a Variety of Patterns.

Write for Folder 120-C D

AVAILABLE IN

Black or Galvanized

Flat Head Less Check
Flat Head With Check
Flat Head With Lock-Wing

Sizes; ¾"—1"—1¼"—1½"—2"

Also HAYS STANDARD
HEAVY PATTERN IRON BODY GAS STOP

For 75 Years the Gas Industry has relied on HAYS Iron Body Gas Stops

Miscellany

Technical Information Clearance Agency Set Up

Secretary of Commerce Charles Sawyer has announced the establishment of a service in his agency to help the public guard voluntarily against the release of technological information which would endanger the national security.

The service, to be operated through the Department's Office of Technical Services, will provide a central place to which state and local officials, representatives of business, other organizations and private citizens may write for guidance as to whether specific technological information not subject to formal security regulations should be released, withheld, or given only limited distribution. Whether or not the individuals follow this guidance is up to them, since the program is entirely voluntary.

Types of information over which such voluntary public guardianship is invited include technical data on advanced industrial developments, advanced production "know-how," or technological improvements in any field, strategic equipment, special installations, and significant integrations of previously scattered groups of information.

The government has been receiving many such requests and the new service is in response to this demand. Inquiries should be addressed to the OTS, U. S. Department of Commerce, Washington 25, D. C. OTS then will check with the appropriate federal specialists and agencies and the expert opinion will be forwarded to the inquirer.

NPC Forms Material Unit

A committee to study the needs of the oil and gas industries for materials and chemicals was appointed last month by the National Petroleum Council. Hugh Stewart, director of the Interior Department's oil and gas division, requested that such a group be appointed.

Chairman of the committee is Reese H. Taylor, president of Union Oil & Gas Co. of California. Included in the roster of members are these prominent gasmen: D. A. Hulcy, Lone Star Gas Co.; W. K. Warren, Warren Petroleum Corp.; and Stuart M. Crocker, Columbia Gas System Inc.

Safety Films Issued

Six training films showing supervisors and foremen how to address and conduct meetings have been issued by the National Safety Council under the title, "Speaking of Safety."

The 35-mm soundslide films, with 16-in., 33⅓-rpm records, run about 13 minutes each. They were prepared under the guidance of Dr. Irving J. Lee, of Northwestern university, Evanston, Ill.

A single set of films packaged in a leatherette case with a leader's manual is available to council members for $100. Quantity prices are lower, and individual films in the series are priced at $18. For non-members, prices are double those listed.

Gas Bans Back on as Winter Demand Builds Up

Despite the recent or pending arrival of natural gas in many new areas, some companies have been forced to impose restrictions on gas usage.

East Ohio Gas Co., Cleveland, advised its industrial gas customers last month that they must take less gas because of extremely cold weather, larger industrial demands than anticipated, and less gas from wholesale suppliers than the company had expected.

Householders in Detroit, Ann Arbor, Grand Rapids, Big Rapids, Muskegon, Mount Pleasant, and the Greenville-Belding district were denied new gas installations when an Ingham county circuit court ruled that Michigan Consolidated Gas Co. may continue a restriction policy. Last May the Michigan Public Service Commission gave MichCon permission to turn down applications for new space-heating installations. Wayne county and the city of Detroit brought suit, but the circuit court upheld the commission's decision.

During an early January cold spell, major industries in Wheeling, W. Va. were limited to 50% of their normal requirements by Manufacturers Light & Heat Co. Since most of the industries have standby supplies of fuel, the order had little effect on production.

Randolph Joins NARUC

John Randolph, of Jefferson City, Mo., former member of the Missouri Public Service Commission, has taken over as general solicitor of the National Assn. of Railroad & Utility Commissioners in Washington. He succeeds Walter R. McDonald, who has returned to Atlanta, Ga., where he is a member of the Georgia Public Service Commission.

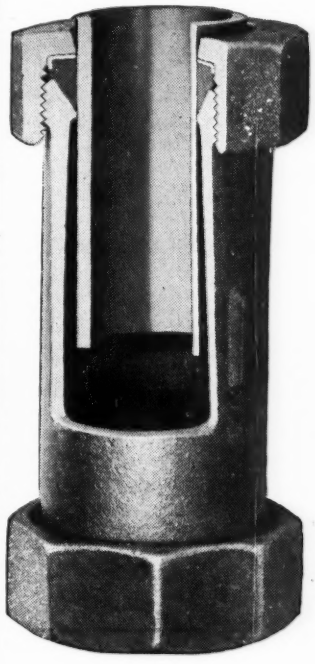
Mr. Randolph says he will work "actively" to over-rule through legislative action the East Ohio case, which he feels has been disastrous to regulatory bodies generally as well as to the natural gas industry.

Newsnotes

Outstanding ads will pay off for 174 winners in the 1951 Public Utilities Advertising Assn. better copy contest when results are announced at the organization's annual convention in New York on May 17 and 18. Twenty-two classifications of advertising and publicity work will be featured, and public utility companies are invited to participate. Rules are available from C. Fred Westin, contest chairman, at Public Service Electric & Gas Co., 80 Park Place, Newark, N. J.

Unitization of oil and gas fields in Arkansas does not come under the jurisdiction of the Arkansas Oil and Gas Commission, the state supreme court has ruled. Upholding a protest of property owners against a commission-ordered unitization in Lafayette county, the

NORMAC
COUPLINGS, SLEEVES and FITTINGS

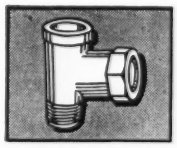


for maximum deflection, ease of "stabbing," complete confinement of the rubber!

So close are "Normac" rubbers confined at the gasket tip that possibility of flow is reduced almost to "nil." These couplings, sleeves and fittings . . . approved by gas utility men across the country for their time-saving features, ease of handling and dependable service . . . are available in a complete range of sizes. Made from air furnace malleable iron they provide greater wall thickness than pipe on which used.

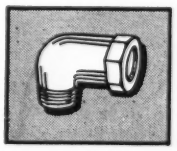
NORMAC COUPLINGS are made with 5" centers in all sizes. NORMAC SLEEVES are identical in design except that they are made with 10" centers. Nuts and gaskets are interchangeable.

COMPRESSION-END SERVICE "TEE"



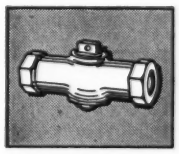
First fitting of this type ever produced with full coupling depth and special threads on male end to prevent dropping into old hand taps when used to replace standard threaded fittings.

COMPRESSION-END SERVICE "ELL"



Extra depth makes it possible to "stab" pipe into stops and without measuring, pull back a safe distance to allow ultimate deflection eliminating possibility of strain against tap in main.

COMPRESSION-END IRON BODY BRASS CORE SERVICE STOPCOCKS



End the necessity of threading on the job plus the elimination of the threads themselves — combining all the advantages of NORMAC COUPLINGS and the best in stopcock design. 2½" coupling depth on each end.

NORMAC BRASS FITTINGS DEVELOPED IN 1939 FOR USE WITH COPPER TUBING

Our complete line of brass fittings can be used either on new installations or where copper is run through old steel pipe in large or small openings. The center to end dimensions of NORMAC TEES correspond with old malleable iron fittings. This feature is extremely important in the use of these fittings in one foot openings where the tubing must line up with the steel which has been removed.

Write for the NORMAC CATALOG of Gas Distribution Equipment

NORTON-McMURRAY MFG. CO.

39 SOUTH LA SALLE ST. • CHICAGO 3, ILLINOIS

Couplings • Meter Bars • Sleeves • Cocks • Bell Joint Clamps • Service Tees & Ells

court said that broad legislation authorizing the regulatory body to prevent waste of oil and gas does not give it the power to order a field unitized. In another case, however, the court stated that if a field is voluntarily unitized, the commission's rules for its operation must be followed.

A tremendous market for gas is suggested in the report of F. W. Dodge Corp., building news and marketing specialist, which states that 1950 construction figures for the 37 states east of the Rockies increased 40% over the 1949 total. Greatest gain was registered in the residential classification—59% over 1949 for a total expenditure of $6,741,-028,000. Non-residential contracts showed a 42% increase over the previous year.

CURRENT READING

HELIUM TRACER-GAS STUDIES in the Cabin Creek, W. Va., Oil and Gas Field—by E. M. Frost Jr. Published as Bureau of Mines Report of Investigations 4715, August 1950.

Helium used as a tracer gas in petroleum reservoirs continues to show great promise as a new tool for the oil and gas industry, according to tests conducted jointly by the Bureau of Mines and The Pure Oil Co. in the Cabin Creek field, Boone and Kanawha Counties, W. Va. Helium, when used as a tracer gas, is mixed with natural gas being injected into a reservoir for secondary recovery of oil, recycling, pressure-maintenance, or other purposes.

Three separate experimental helium tracer-gas tests were run in the Cabin Creek, W. Va. field, wherein helium was added as a tracer to the natural gas that was being injected into the oil-bearing Berea sandstone. The results obtained in each test permitted determining the direction and rate of travel of the injected gas, calculating the volume of injected gas in the gas produced at the various wells, and determining the nature of the transition from natural gas to injected gas during a gas-injection program. Data were obtained on the effects obtained from waves of injected gas containing 1% and containing 5% helium and from a wave of essentially pure helium injected into the formation.

Helium is unusually well-suited for use as a tracer gas. It is present naturally in varying but usually very dilute concentrations in virtually all natural gases in the U. S. The arrival of the added tracer helium at a producing well is revealed by sustained changes in the helium content of the gas rather than by the absolute presence or absence of helium. The formation fluids and the formation itself have had ample opportunity to come to equilibrium with the natural low helium-content gases in the reservoir, and any of the added tracer helium that may go into solution at the front of the wave of helium-enriched gas will be released in the reestablishment of equilibrium as the wave passes. Helium is chemically inactive, so that none is lost by chemical action as it moves through the reservoir. Its solubility in water is less than for any other known gas. Its solubility in crude oils has not been determined, but all evidence indicates that it at most is only slightly soluble in the oil. Thus, there is little if any probability that the added tracer helium will separate out from the injected gas as the wave of helium-enriched natural gas moves through the formation. The helium content of natural gas can be determined readily and with precision[1], so that only relatively small volumes of helium are required in a tracer project.

PSYCHOLOGY OF SAFETY IN SUPERVISION—Published by National Safety Council, 425 N. Michigan Ave., Chicago 11. Six new training booklets for foremen and supervisors and a leader's manual have been written by Dr. J. L. Rosenstein, Loyola university, Chicago. Titles of the booklets are "You Can't Change Human Nature," "What Is Your U Q?" (understanding quotient), "Teaching Safety on the Job," "People Act Alike," "Safety Takes Teamwork," and "You Are Human Too." Members may obtain the set for 90 cents each in quantities from 1 to 9, 85 cents for 10 to 99, 80 cents for 100 to 999, and 75 cents per set for 1000 or more. Prices to non-members are double.

LABOR RELATIONS WORK KIT—Published by National Foremen's Institute Inc., New London, Conn. and edited by Lawrence Stessin. This manual is designed to make available to labor relations and personnel men solutions to specific problems. Step-by-step "how to do it" procedures, which have actually been practiced by other companies, are cited. Price: $7.50.

[1]Frost, E. M., Jr., Improved Apparatus and Procedure for the Determination of Helium in Natural Gas: Bureau of Mines Rept. of Investigations 3899, 1946, 16 pp.; also *GAS*, Oct., 1946, pp. 34-38.

RESIDENTIAL METER AND REGULATOR COVER

ATTRACTIVE — DURABLE — PROTECTIVE

MATERIAL—
*Zenaloy** a reinforced plastic made from Fiberglas and polyester resin material.

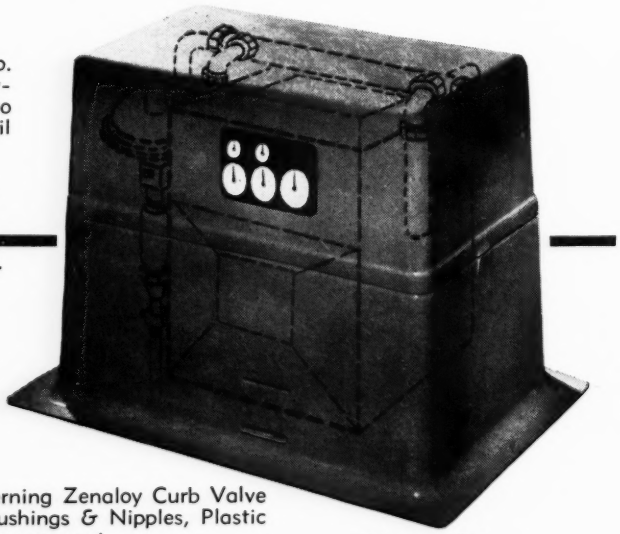
STRENGTH—
Flexural Strength—approx. 25,000 psi.
Tensile Strength—approx. 18,000 psi.
Compressive Strength—approx. 20,000 psi.
The impact strength of this material is very high and will be approximately 15 ft-lbs/in. of width. The modulus of elasticity is approximately 1 ½ million.

WEIGHT—
1/5 the weight of steel. 25% lighter than aluminum.
1/10 the weight of concrete. Complete unit weighs 12 lbs.

Cannot rust or warp. This protective cover is impervious to all weather and soil conditions.

FOR IRON OR TIN METERS

GROUND LEVEL



Patent pending

Information concerning Zenaloy Curb Valve Box, Insulating Bushings & Nipples, Plastic Tubing furnished on request.

ZENALOY* is the trade name for the reinforced plastic material furnished by Zenith Plastic Co.

GORDON Z. GREENE CO.

Manufacturers of Oil & Gas Specialties

2335 East Eighth St., Los Angeles 24, California **TUcker 1279**

PLANNING A CORROSION CONTROL PROGRAM: VI

Cathodic Protection has Paid off in New Orleans

By SIDNEY E. TROUARD

New Orleans Public Service Inc.

IN 1927, our company undertook the job of bringing high pressure natural gas into the city of New Orleans, using coated steel mains. Because of previous knowledge of the extremely corrosive soils, we were concerned about the safety of the steel lines from corrosion. To appreciate our concern, you really have to know a little about the New Orleans soils.

First of all, much of the city is below sea level. The majority of the area which now comprises the city was formerly tidal swampland, overrun with cypress trees. Tidal overflows from Lake Pontchartrain, an arm of the Gulf of Mexico, and subsequent evaporation of the brackish water left high concentrations of salt in the underlying soil. Also, during the frequent overflows of the Mississippi river, the heavier sand particles deposited by gravity near the river front area, resulted in good soils there, but the lighter silts and colloids remained in suspension until deposited by gravity and evaporation in the lower and more remote areas of the city.

The combination of an enormous number of buried cypress stumps, and the very marked soil settlement has constituted one of the biggest headaches our gas department has had to cope with. When the lower elevation areas of the city were populated, cast iron low pressure gas mains were installed. Subsequently, subsurface drainage was installed, which resulted in marked soil subsidence. The old cypress stumps remained at their original elevations while the surrounding

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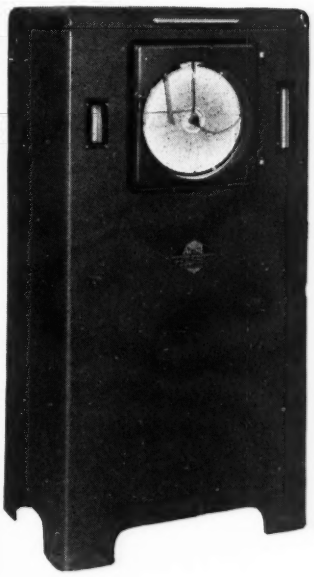
"Planning A Corrosion Control Program," a symposium, was presented in the August through December issues of GAS in 13 parts.

Sidney E. Trouard

Because of space limitations, the 1st and 15th sections of the original presentation were omitted. So many requests have been received for reprints of this symposium that we have decided to print Mr. Trouard's paper, the final section of the series, in order to make the presentation more nearly complete. This article tells the story of a corrosion control program utilizing the procedures suggested in previous installments of this symposium.

when *accuracy* counts...

AC-CURATE ME-ASUREMENT AC-ME PRECISION INSTRUMENTS TRADE MARK REG U.S. PAT. OFF



accurate

sensitive

continuous record

automatically compensated

AC-ME

Recording Gravitometer

The Ac-Me Gravitometer accurately records the changing gravity of gas. It is fully compensated for changes in temperature and barometric pressure. Conforming to usual high standards of R.S. and Ac-Me instruments, it can be supplied with automatic controller if desired. Always consult Refinery Supply Company for your laboratory and instrument requirements.

FREE!
Write for Bulletin
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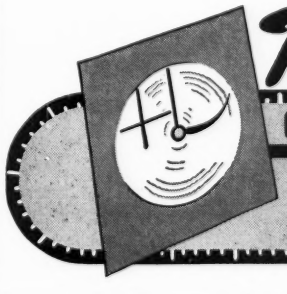


Refinery Supply Co.

621-23 E. 4th St. Tulsa 3, Oklahoma

Laboratory Apparatus
Instruments Chemicals
MANUFACTURER OF R.S. SPECIALTIES

earth subsided, and unequal settlement of the mains on these stumps caused severe trapping of the cast iron mains and resulted in numerous breaks.

Acid Muck Very Corrosive

The same was true for the areas bordering along Lake Pontchartrain, where the soil is known as acid muck. The National Bureau of Standards classifies this soil as the second most corrosive in the United States. In the latter area, life of good, sand-cast 6-in. cast iron gas mains, because of corrosion and breakage from soil subsidence, was only from 10 to 15 years. Soil resistivities encountered frequently ranged from 200 to 400 ohm-cm, while soil analysis showed high chloride and sulphate contents—two constituents known to have a marked bearing on soil corrosivity.

So, the fear that we felt back in 1927 and 1928 was not unnatural. Most of the early mains were 20-in. and 16-in. steel, which we mill-coated ourselves (there were no commercial mill applicators in those days) with what was then thought to be the best coating available.

We didn't have to wait too long to have our fears justified. The severe soil settlement mentioned above caused rupture of the pipe coating in quite a few areas and rapid soil corrosion followed. Examinations of the 20-in. main in September 1929, 15 months after the line was built, showed corrosion had penetrated one-quarter through the 3/8-in thick pipe wall!

We bought an old second hand battery charging rectifier and installed what we think was the first application of cathodic protection to a coated steel gas system in the United States. This was in February 1930. Cathodic protection was not immediately effective because there were many places where contacts existed between the coated steel system and the water system, which were not all removed until March 1931. By that time, the mains were nearly three years old and corrosion had proceeded until the pitting in spots had penetrated half way through the pipe walls. With the contacts removed and cathodic protection effective, the results have been most gratifying.

Tests Show Corrosion Arrested

We have had several occasions to go back and dig up for examinations those exact spots where the main was found deeply pitted, and measurements made years later showed that the pit depths were the same and that corrosion had been arrested.

In 1936, we started laying coated steel for low pressure gas distribution use in areas of the city where the severest breakage and corrosion had been experienced. In 1945, we made a very thorough economic study as to where it would be most feasible to put in steel mains in New Orleans, and where it would be more feasible to put in cast iron. Costs of breaks, trapping, and other maintenance woes on the cast iron system were balanced against higher original installation costs of coated steel with the cost of cathodic protection application and maintenance tacked on.

What we found was somewhat startling. The elevation of the city near the river front is about 33 ft Cairo datum, tapering down to 18 ft Cairo datum in the lower elevations. Mean sea level is 20.4 ft Cairo datum. Our studies showed there was an unmistakable relationship between serviceable main life of cast iron mains and elevation of ground surface, Cairo datum. The lower the elevation, the less the life. The lower the elevation, the greater were the maintenance costs on cast iron for breaks, traps, etc.

Our economic study indicated a practical economic division line of about 22 ft Cairo datum. That is, we decided to put in all new and replacement mains as cast iron in elevations above 22 ft and all new and replacement main as coated steel below 22 ft. Within the past few years fully 90% of all gas mains that we installed were of coated steel. We presently have 228 miles of coated steel mains, of all sizes and pressures (not counting services), every foot of which is under cathodic protection.

No Failures Reported

We are most happy to report that, despite our poor soils, *we have not had one single case of corrosion leak or corrosion failure* on our steel gas system, some mains of which were laid as far back as *1927*. This good record was largely instrumental in our being able to sell our management on the use of thinner wall pipe. We have now standardized on pipe walls approximately *21% thinner* or lighter than sizes we formerly used. This results in a very substantial saving (estimated $35,000 for 1949 for pipe alone) and will

for LOWEST COST *on* DISTRIBUTION TRENCHING

CLEVELAND TRENCHERS

CLEVELANDS famous versatility, CLEVELANDS wide range of trench sizes, and CLEVELANDS 5-minute loading for fast jumps between jobs mean you do more jobs with fewer machines. CLEVELANDS compact design, hairline maneuverability and reversible power-shift conveyor mean quick, easy work among narrow city clearances. CLEVELANDS comparatively light weight and full-crawler mounting with smooth-surface crawler pads cut expensive damage to walks and lawns. CLEVELANDS give you the rugged power for tough, off-season digging in frozen, rocky ground, along with the proved higher digging capacity that protects your schedules and deadlines. To all these cost-cutting features add CLEVELANDS established lower operating and maintenance expense. Get the details from your local distributor or write direct.

THE CLEVELAND TRENCHER CO.
20100 ST. CLAIR AVE.
CLEVELAND 17, OHIO

further increase our use of steel.

We've had to go through just about all the steps mentioned in previous installments of this symposium. Our planning was along a little bit different lines from those outlined by Mr. Simpson (*GAS*, Aug., p. 80) because our problem was somewhat different. Immediately after our first venture into cathodic protection, we designed all of our lines from 1930 on with cathodic protection included as part of the design. We didn't have too much data on corrosion costs to work on in the early years, but the prospect of losing our entire steel system of 16- and 20-in. pipe in about five years was incentive enough to initiate early institution of some sort of protective scheme. Certainly, we didn't have much of a job selling management on at least trying cathodic protection with corrosion as rampant as it was.

Selling the Program

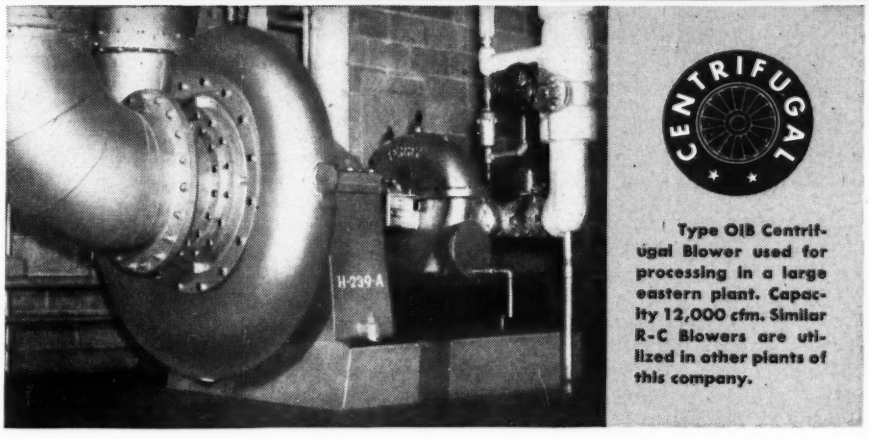
We did find it very much to our advantage to sell cathodic protection all down the line from the top officials of the gas department to the foremen, caulkers, welders, dispatchers, laborers; in fact, to the entire gas department. We held instruction classes and seminars, and gave lectures on the simple fundamentals of corrosion. We prepared manuals and lists of instructions on what to do and what not to do in handling coated steel pipes with care, avoiding contacts with other underground structures, proper installation of insulated joints, galvanic anodes, and all the other phases of corrosion protection work. We arranged for revisions of construction standards and maintenance standards.

We soon found it paid dividends to cooperate with other utility companies who operated underground plants in our area. As a matter of record, we know of no case and we've received not a single complaint about so-called cathodic protection interference. We were told that cathodic protection in a large crowded city was impossible, but we've been doing it successfully now for fully 21 years, with no unpleasant repercussions. As for proper instruments, we have found that good, accurate, rugged instruments were absolutely indispensable in our work. They are the electrical eyes with which we see and govern our thinking and planning.

Anode Selection

As to whether to use rectifiers or galvanic anodes, we use both. Each has its own advantages. The choice must be governed by the peculiarities of each specific problem. Likewise, wherever possible, we use stray railway current for cathodic protection and, in some cases, fairly large motor generators to supplement diminishing stray railway currents.

The first thing to do about a corrosion problem would be to appraise the problem, particularly as to cost, and to balance this cost against the cost of stopping the corrosion through various accepted engineering practices. If the situation is serious enough to warrant attention, time and money would be saved by hiring a good corrosion engineer or consultant to establish a corrosion department. This might take a couple of years, but it would be cheaper and more effective than trying to start from scratch. We had to do it the hard way, but with the present advances in modern corrosion engineering, solution of the problem can be simpler.



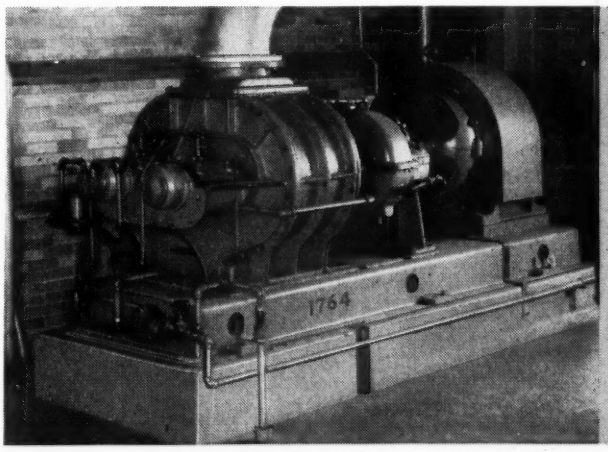
Type OIB Centrifugal Blower used for processing in a large eastern plant. Capacity 12,000 cfm. Similar R-C Blowers are utilized in other plants of this company.

The works manager of a large plant made this friendly statement to a Roots-Connersville representative. What he really meant was that R-C Blowers and related equipment perform so satisfactorily and dependably that they seldom need anything more than routine inspection by his own men.

In large and small plants, in every industry, R-C products uniformly give this kind of reliable operation. They continue to deliver rated capacities, year after year, with a minimum of maintenance—whether a small Rotary Positive Blower of 5 cfm capacity or a Centrifugal unit moving up to 100,000 cfm. And remember, only Roots-Connersville gives you this important dual-choice.

If you are planning a new plant, expansion, or replacements, R-C engineers will work with you to select the equipment best fitted to your needs. Almost a century of experience is at your service.

ROOTS-CONNERSVILLE BLOWER CORPORATION
510 Oregon Avenue, Connersville, Indiana



ROTARY

Two, Type RCDH Rotary Positive units used in vacuum service by public utility. Capacities 3,380 cfm and 3,490 cfm, respectively.

ROOTS-CONNERSVILLE
BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

PEOPLE

H. G. LAUB, supervising engineer, distribution department, recently resigned from Southern California Gas Co., Los Angeles, to devote his time to the presidency of Southwest Gas Corp., Barstow, Calif. Southwest is taking gas from El Paso Natural Gas Co.'s line and serving it to Bartsow, Victorville, and adjoining areas in eastern California. Mr. Laub had been associated with SoCal for 19 years. He has been an active member of the PCGA, serving as chairman of the technical committee in 1939.

H. G. Laub

After 50 years of service, P. A. WILSON retired Dec. 31 as assistant secretary of Philadelphia Electric Co. He has been succeeded by HOWARD R. CRESSMAN, an employee of the firm since 1911.

Bendix Radio Communications Division of Bendix Aviation Corp., Baltimore, has announced the appointment of ROBERT S. BARNHILL as manager of mobile radio sales. Mr. Barnhill was transferred from the firm's Chicago office where he had served as district sales manager since early 1949.

Three Chicagoans have been appointed vice presidents in the engineering and construction division of Koppers Co. Inc., Pittsburgh. They are GORDON FOX, HARRY NAISMITH, and W. B. CLEMMITT, all of whom have been associated with Koppers subsidiaries. On Jan. 1, Freyn Engineering Co., a subsidiary, became a department of Koppers' engineering and construction division. The Freyn department will be directed by W. C. SNYDER JR. and will continue to maintain offices in Chicago.

Perfection Stove Co., Cleveland, Ohio has announced the appointment of W. F. LEUSZLER as assistant to H. C. Erhard, manager of the range and heater division. Mr. Leuszler has served as order clerk, assistant credit manager, chief clerk, and for the past year, as a member of the Kansas City sales staff.

Four executives recently were elected to key management positions by the board of directors of East Ohio Gas Co., Cleveland. WILLIAM G. ROGERS, vice president since 1939, was named executive vice president. New vice presidents include GEORGE W. HORSLEY, ROBERT W. RAMSDELL, and JOHN H. CARSON. These men are, respectively, general manager, general superintendent, and chief engineer.

The board of directors of Caloric Stove Corp., Philadelphia, has announced election of new officers, effective Jan. 1. NATHAN R. KLEIN, former president, is now chairman of the board. JULIUS KLEIN, who was vice president and sales director, is now president, and MEYER KLEIN is vice president. Other officers are J. W. ROBERTS, vice president in charge of manufacturing; HARRY W. KLEIN, treasurer, and B. SPENCER BAKER, secretary. Julius Klein will continue supervision of company sales in addition to his new responsibilities.

Julius Klein

Election of LORENZO SEMPLE as vice president and treasurer and of JOHN W. BRENNAN as secretary has been announced by U. S. Pipe & Foundry Co., Burlington, N.J. Mr. Brennan has been company counsel for the past five years and will retain that position. DONALD ROSS has resigned as secretary-treasurer.

FRANCIS W. CROSS has been named sales engineer, heavy machinery division, Nordberg Manufacturing Co., Milwaukee. He formerly held the same position with Nagle-Hart Tractor & Equipment Co., Milwaukee.

More Peerless ODORIZERS Ready For Delivery...

YES . . .

The demand for PEERLESS ODORIZERS is increasingly greater—after 15 years—adding to hundreds now in use all over the country. REASON: PEERLESS ODORIZERS automatically maintain an accurate odorization rate during variations of flow, temperature and pressure, and provide maximum efficiency with a minimum of maintenance.

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FOR trouble-free Gas Appliances

USE THERMAC

Appliance Regulators

1. *Provides constant pressures, constant BTU input and constant flame height.*
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Millions of THERMAC Gas Appliance Regulators are in service today on gas furnaces, space heaters, conversion burners, refrigerators, water heaters, air conditioners, boilers, dryers, etc. More and more manufacturers are going to THERMAC simply because THERMAC Regulators are *DEPENDABLE* 24 hours a day under all operating conditions. The reputation of a fine appliance depends in no small degree upon the behavior and control of its gas regulator. Play safe. Use THERMAC—a product with wide national acceptance.

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This is a full-rate telegram or Cable-gram unless its de-ferred character is in-dicated by a suitable symbol above or pre-ceding the address.

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From -- Detroit, Mich., Feb. 15, 1950

To: UNIT HEATER BUYERS EVERYWHERE

NOW YOU CAN GET AMERICAN BLOWER GAS-FIRED UNIT HEATERS

AMERICAN BLOWER CORPORATION

American Blower, pioneer in the Unit Heater field, now offers a complete line of self-contained Gas-Fired Unit Heaters for use with manufactured, mixed, natural and liquefied petroleum gases. And these new units are right in stock in a wide range of sizes, ready to be delivered to you for any and all your needs.

These rugged American Blower Gas-Fired Unit Heaters are designed for long, hard service, and are finished in a pleasing manner to harmonize with the appearance of modern business interiors.

Each unit has an aluminized steel combustion chamber built to resist corrosion.

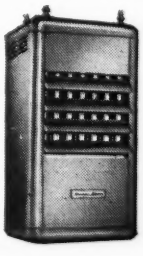
The sturdy steel casing enclosure is bonderized, too, as additional protection against rust, prior to the application of a durable baked-enamel finish.

These units carry the seal of the American Gas Association, of course.

We're sure you will be pleasantly surprised when you see these new American Blower Gas-Fired Unit Heaters. They're designed to provide years and years of heating comfort at exceptionally low cost.

Data on American Blower Gas-Fired Unit Heaters or on units for steam or hot water systems are available from heating supply houses, heating contractors or from the nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICH.
Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION



American Blower Gas-Fired Unit Heaters are available in 7 sizes with capacities ranging from 70,000 to 230,000 Btu/hr. input. Write for Bulletin 7117.

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POST OFFICE BOX 378 . . . LANCASTER, OHIO

On Jan. 1, T. H. CREDEN, eastern district tubular product sales manager for A. O. Smith Corp., took over as assistant manager of the company's tubular division at Milwaukee. Mr. Creden will assist DENNIS F. McCARTHY, whose responsibilities have been expanded to include those of vice president and general manager of A. O. Smith Corp. of Texas, operator of a new Houston pipe mill. Succeeding Mr. Creden in New York is WALTER D. WOOD, former branch manager in Boston. At the same time, A. G. HENDRICKSON joined the company as welding division sales manager.

Vulcan Rubber Products Inc., Brooklyn, has announced the appointment of EDWARD C. HEMES as general manager and of JAMES H. McGOURTY as a salesman. Mr. Hemes was previously manager of the gas meter diaphragm division of the firm. He has been with the company since 1946 and was formerly associated with Milwaukee Gas Light Co. for 19 years. Mr. McGourty has been east coast sales manager and director of labor relations for Superior Meter Co. for the past five years.

RICHARD T. REDDINGTON has been appointed service manager of the Delco Appliance Division of General Motors Corp., Rochester, N.Y. He has replaced KENNETH O. WOLCOTT, who retired after 37 years of service. Mr. Reddington has served as field service engineer and since 1946 as Delco-heat service manager.

Election of DR. THOMAS L. HARRIS as a director of Consolidated Natural Gas Co., New York, was announced recently by the company. Dr. Harris fills a vacancy which has existed since the death of John M. Crawford last July.

Three employess of Tappan Stove Co., Mansfield, Ohio have been promoted to new positions with the firm. J. S. LeMUNYON, assistant plant superintendent, is now plant superintendent. B. L. HOWER has replaced Mr. LeMunyon, and M. E. HOUSTON has succeeded Mr. Hower as production manager.

JOHN J. McKEARIN has been appointed assistant sales manager of Laclede Gas Co., St. Louis. Mr. McKearin has had a long public utility career, including a position as manager of domestic sales for Boston Consolidated Gas Co.

After 47½ years of service with The Manufacturers Light & Heat Co., Pittsburgh, LEONARD W. STABILE, local manager in

Permaglas **makes 1951 your year for more gas water heater sales!**

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Permaglas costs no more

THAN ORDINARY WATER HEATERS!

Think what this means to YOU!

Every prospect for an automatic water heater can now afford *Permaglas* because it COSTS NO MORE than an ordinary water heater. Mass production savings make this possible. More than a million water heaters have been shipped from A. O. Smith's huge Kankakee Works. Such popularity now pays off in new profit opportunities for you—with *Permaglas* models and sizes to fit every customer's budget and hot water need!

Outsells because it outfeatures!

These features add up to MORE "sell." The famous glass-surfaced steel tank that can't rust because GLASS CAN'T RUST! *Ceramitron* Construction—new *Permaglas* exclusive—assures positive protection of glass-surfaced steel tanks against attack by all corrosive waters! *Permaglas* is the gas water heater that can be demonstrated! All these features make *Permaglas* easier to sell!

In 1950, A. O. Smith led all manufacturers in volume of national consumer water heater advertising! And MORE powerful national advertising is about to break the big 1951 *Permaglas* news to your customers and prospects. Make it mean Big Business for you!

SEND FOR FREE DON HEROLD BOOK ON NEW PERMAGLAS CERAMITRON CONSTRUCTION—AND FACTS ON PERMAGLAS PROFIT OPPORTUNITIES!

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Send me, FREE, a copy of Don Herold's new book on *Ceramitron* Construction and facts about the new *Permaglas* sales opportunities in 1951.

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Houston 2 • Los Angeles 12 • Midland 5, Texas
Milwaukee 2 • New York 17 • Philadelphia 3 • Phoenix
Pittsburgh 19 • Salt Lake City 1 • San Diego 1
San Francisco 4 • Seattle 1 • Tulsa 3 • Washington 6, D.C.
International Division: Milwaukee 1
Licensee in Canada: John Inglis Co., Ltd.

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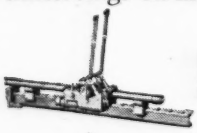
ON UNDERGROUND

PIPING JOBS

...with a GREENLEE PIPE PUSHER

Installing pipe underground is quick and simple this way. With a GREENLEE Hydraulic Pipe Pusher *one man* pushes pipe through the ground—under streets, railways, walks, lawns, floors. Saves time, cuts costs through elimination of extensive ditching as just a short trench accommodates the Pusher. No tearing up of pavement, lawns, floors... eliminates tunneling, back-filling, tamping, repaving. Cuts job time to a fraction. Pusher often pays for itself through timesavings on first job or two.



No. 790 GREENLEE PUSHER For 3/4 to 4-inch pipe. Six speeds—5,600 to 40,000 lbs. pushing pressure.

No. 795 GREENLEE PUSHER For pipe larger than 4-inch, concrete sewer pipe, large drainage ducts. Six speeds—25,000 to 150,000 lbs. pushing pressure.

POWER PUMP For both sizes of GREENLEE Pushers. Pushes pipe at rate of two feet per minute.

TOOLS FOR CRAFTSMEN

GREENLEE

Get facts on timesaving Greenlee tools now. Write Greenlee Tool Co., Division of Greenlee Bros. & Co., 1942 Columbia Avenue, Rockford, Illinois, U. S. A.

the South Hills area of the city, retired Dec. 31. He has been succeeded by CARROL A. UPDIKE, who has been associated with the company since 1927. HARRY A. LINDAHL, South Hills distribution engineer, has been named to the same position for Manufacturers and the entire Pittsburgh Group.

New district sales engineer for Byron Jackson Co.'s Tulsa, Okla. office is DEAN DE GRAFFENREID. He joined the company as test engineer in 1947 and was later assigned to the Los Angeles branch sales department. He moved to the Tulsa office last May.

Appointment of JOHN C. KOCH as vice president in charge of sales has been announced by the Conoflow Corp., Philadelphia. Mr. Koch, who joined Conoflow in 1945, has been serving as general sales manager of the company.

United Gas Corp., Shreveport, has converted the local DeRidder, La. office to a district office with PRESTON D. McNEELY, local manager, as district manager. . . N. HENRY GELLERT, president of Seattle (Wash.) Gas Co., was elected a member of the National Industrial Conference Board Inc. for a one-year term at the group's December meeting in New York. . .

New operating superintendent of the Binghamton, N.Y. district of New York State Electric & Gas Corp., Ithaca, is SAMUEL D. VAN KIRK. For the past five years he has been general foreman of construction and maintenance in the Binghamton area. . .

J. RICHARDSON DILWORTH of Princeton, N.J. has been elected to the board of directors of Rockwell Manufacturing Co., Pittsburgh. . . A. C. WINTERS recently resigned his position as secretary-treasurer of North Shore Gas Co., Waukegan, Ill., although he will continue to serve on the company's board of directors.

- OBITUARIES -

HIRAM BURRELL HARDWICK, 52, comptroller and director of Consumers Power Co., Jackson, Mich., recently died of a heart attack. His utility career began with Alabama Power Co., Birmingham, in 1918. In 1925 he joined Southeastern Power & Light Co., New York, predecessor of The Commonwealth & Southern Corp. of which he was assistant comptroller from 1930 to 1947. Mr. Hardwick became comptroller of Consumers Power in 1947 and was elected to the board of directors in 1949.

On Dec. 28, EDWIN E. HEDENE, chief engineer of Nordstrom Valve Division, Rockwell Manufacturing Co., died in Pittsburgh at the age of 54. Mr. Hedene was chief engineer of the Nordstrom Valve plant in Oakland, Calif. for 23 years before moving to Pittsburgh.

A. VIRGIL McREE, 50-year-old secretary of Michigan Consolidated Gas Co., Detroit, died on Dec. 27. He had been ill for about a year. Mr. McRee was also secretary of Michigan-Wisconsin Pipe Line Co. for four years and was secretary of Austin Field Pipe Line Co. at the time of his death.

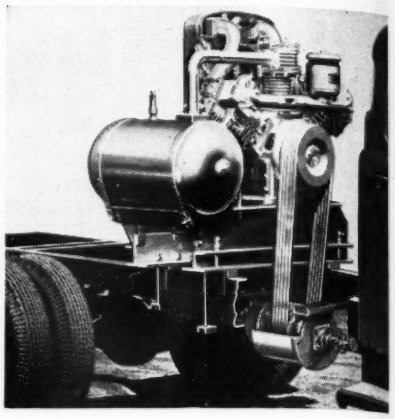
NEW PRODUCTS

Compressor

JAEGER MACHINE CO., Columbus 16, Ohio.

MODEL: Travel-Air 125.

DESCRIPTION: This unit mounts on any of five makes of 1½ and 2-ton rated trucks, adapts to special body designs, and derives power from the truck engine through a power takeoff. For crews using air tools requiring 100-lb air, this unit is said to have advantages over trailer-type units of like capacity. It furnishes 125 cfm of 100-lb air and is capable of driving two heavy duty or three medium duty pavement breakers at 90-lb pressure at the tools. Two levers in the truck cab control all functions. Compressing speed is 1750 rpm, about 24 mph.



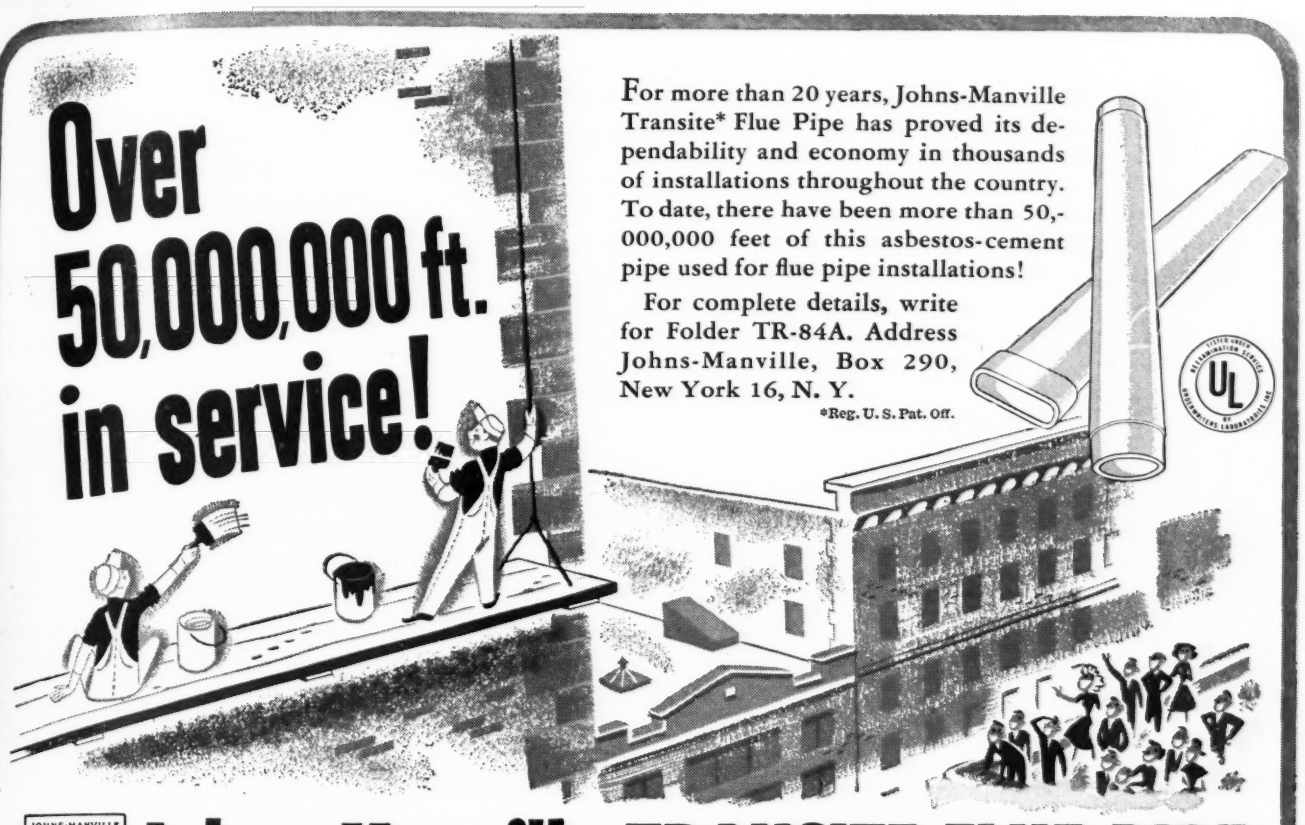
Range

TENNESSEE STOVE WORKS, Chattanooga 1, Tenn.

MODEL: Modern Maid.

DESCRIPTION: Center simmer burners, automatic oven ignition with 100% safety shutoff, and an automatic oven controlled by the clock in the backguard are features of this range. The design incorporates a massive backguard with a streamlined front. Other features are two giant and two regular burners, individual drip pans (each of which holds more than 6 oz of spillover), and recessed manifold cover for cooler gas cock handles.

Over 50,000,000 ft. in service!



For more than 20 years, Johns-Manville Transite* Flue Pipe has proved its dependability and economy in thousands of installations throughout the country. To date, there have been more than 50,000,000 feet of this asbestos-cement pipe used for flue pipe installations!

For complete details, write for Folder TR-84A. Address Johns-Manville, Box 290, New York 16, N. Y.

*Reg. U. S. Pat. Off.

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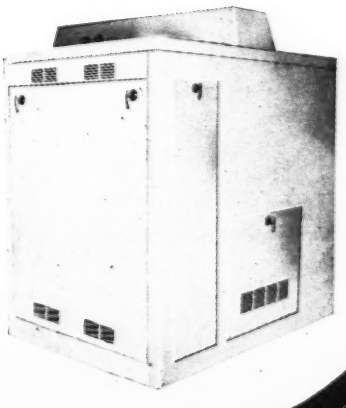
Johns-Manville TRANSITE FLUE PIPE

FOR VENTING DOMESTIC GAS-BURNING APPLIANCES

The Evans Unit Solves Solution Heating Problems!

• You men in the gas industry can do a great favor to bottling, brewing and dairy plant customers by recommending the Evans Automatic Heating Unit. This unit provides FULLY AUTOMATIC solution temperatures for bottle washing machines . . . eliminates expensive, troublesome boilers . . . saves the user money, time, trouble, bottles! Write for our folder: "The Calorific is Terrific."



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LITTLE ROCK, ARKANSAS

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Digs Small Ditches Faster At Lower Cost, A One-Man Operation

The rugged *Longhorn Mobile Ditcher* has proven itself indispensable for all types of small ditching under every digging condition.

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use the Longhorn to lay gathering lines.

UTILITY MEN

say it is faster and more economical for running main extensions and house to street service lines.

CONSTRUCTION MEN

find it ideal for quickly digging foundation ditches for dwellings.

The Longhorn Mobile Ditcher is rugged, powerful, easy to handle, a one-man operation. Moves quickly from job to job under its own power.

You should have the facts about the Longhorn Mobile Ditcher. Write us today for literature.

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INDUSTRIES, INC.
Phone 4535 • P.O. Box 350
HENDERSON, TEXAS

Regulator

DETROIT REGULATOR CO., 1742 Rivard, Detroit 7, Mich.

MODEL: RV-90 Maxitrol.

DESCRIPTION: This regulator is now available in 2 and 2½-in. sizes. "Straight-thru-flow" design makes available high capacities in a regulator which measures 9⅛-in. in

height and diameter and weighs 7½ lb. This compactness permits ease of handling and reduced freight expense. Capacity for the 2 and 2½-in. sizes at .3-in. pressure drop in Btu's per hour is 1,502,000 with 800- (or more) Btu gases and 1,015,000 with 500-Btu gases. Figured at .5-in. pressure drop, capacity is 1,939,000 and 1,310,000, respectively.

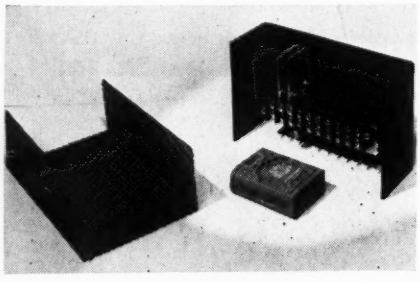
Hygrometer

MINNEAPOLIS-HONEYWELL REGULATOR CO., Brown Industrial Division, Philadelphia 44.

MODEL: Electric hygrometer.

APPLICATION: For industrial application where accurate control of humidity is important to processing.

DESCRIPTION: This system, scheduled for delivery this month, includes a single-point Electronik recorder of a circular or strip chart type, with or without control, and a small element which does away with the use of human hair. The element makes use of



gold leaf and a chemical salt solution that eliminates cleaning and other maintenance.

The company lists as advantages of the system its provision for direct relative humidity reading without assistance of psychrometric charts, its use for sensing changes between the limits of 20 and 93% relative humidity, its minimum span of 20% relative humidity throughout its 20 to 93% range, and the availability of all ranges with full temperature compensation between the limits of 50 to 120°F.

Three advantages are claimed for the system's ability to provide remote reading: it will operate over distances up to 1000 ft, making possible centralized control of a complete installation from a supervisory panel; unit control is available adjacent to the critical zone being controlled; and remote transmission allows supervisory monitoring of multi-unit, single zone control.

The instrument is calibrated to plus or minus 1% accuracy, allowing relative humidity to be held within closer tolerances than were previously possible. Responsiveness of the sensing element is greater than "dimensional change" hygrometers; 63% of total change is registered in 10 seconds. Complete air filtration and elimination of psychrometric accessories minimize maintenance. The sensing element is generally unaffected in corrosive atmospheres normally encountered in industrial working areas.

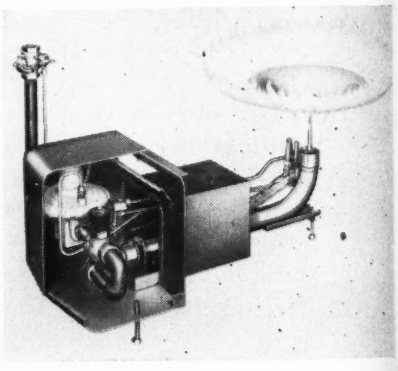
The photograph shows a composite of a humidity sensing element used in its new electronic hygrometer. Based on the fact that air conducts more electricity when moist than when dry, the instrument is capable of detecting changes in relative humidity down to .002%.

Heart of the unit is the sensing element, which is about the size of a matchbook cover and consists of a clear plastic base on which conducting electrodes are mounted. The electrodes are made of pure gold leaf and are pressed onto the surface of the plastic base. Electrodes are separated from each other like the teeth of two inter-locked combs, and the entire element is coated with a thin solution of chemical salts.

Conversion Burner

TIMKEN SILENT AUTOMATIC DIVISION, Jackson, Mich.

MODEL: Domestic gas conversion burners.

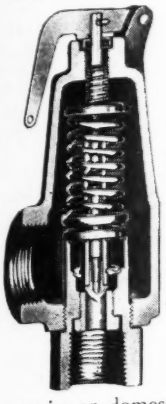


DESCRIPTION: These units, which cover the range of domestic requirements up to a rate of 300,000 Btu/hr, feature a single-port, self-piloting, flame-retention type burner head. Pilot assembly slides on a rack into position for easy removal. A special feature is the improved chrome-iron flame deflector which produces a "wall-flame" effect by directing the flame to all sides of the combustion chamber. New "silvertan" baked enamel cabinets extend 10½ in. from the front of the heating plant. Easily removable for inspection and adjustment, the cabinets conceal and protect all burner controls.

Relief Valve

McDONNELL & MILLER INC., Chicago 18, Ill.

MODEL: Series 3345-33150.

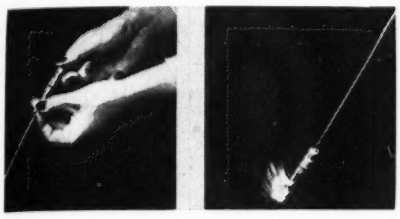


DESCRIPTION: Designed to prevent excess pressure under every condition that can develop in a hot water system, each valve in this series is rated in Btu capacity, its capacity to dissipate heat. The valve that will open at the desired pressure and that has capacity equivalent to heat output of the firing means may be selected. In addition to service on domestic hot water tanks and heaters, these valves are capable of handling the need for rated safety relief valves on hot water heating boilers designed for higher working pressures. Opening pressures are 45, 75, 100, and 150 psi. Inlet connections are ¾-in.; outlet connections are 1-in.

Match Lighter

LEWIS & SLOCUM, 414 Ford Bldg., Detroit 26, Mich.

MODEL: Saf-T-Fire.

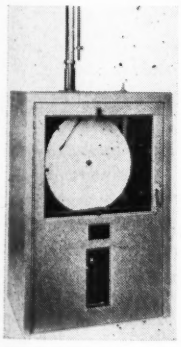


DESCRIPTION: This mechanical match lighter is constructed of rust protected steel and is said to be almost indestructible. It is designed to ignite oil, and gas burners and furnaces, ovens, stoves, hot water heaters, fireplaces, and barbecue fires. Simplicity and safety features are pointed up as advantages.

Gravitometer

AMERICAN RECORDING CHART CO., 3113 E. 11th St., Los Angeles 23, Calif.

MODEL: Arcco gas gravitometer.



DESCRIPTION: In this model all parts which come in contact with the sample are made of stainless steel. This applies to the standard instrument and the "dry air" type. These instruments, for both corrosive and non-corrosive gases, are made in two standard ranges. One is a .5 sp gr using 150 cm column in which the range may cover .5 to 1.0; .7 to 1.2; and 1.0 to 1.5. The other is a 1.0 sp gr range using a 75 cm column. In this case, the range would cover from 0 to 1.0; .5 to 1.5, or 1.0 to 2.0.

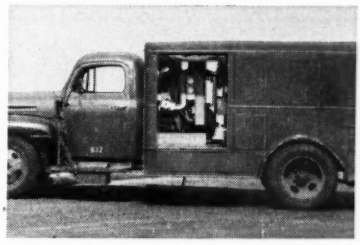
Now, a truck-mounted compressor powered by your truck's engine

Jaeger

"TRAVEL-AIR"

For big savings in first cost, half the maintenance cost, and remarkable operating advantages.

Furnishes 125 cfm at 100 pounds pressure.



Travel-Air Compressor units are easily adapted to your own truck body designs. For five makes of 1½ and 2-ton rated trucks.

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Other Jaeger Compressors — Portable and Stationary — 56 to 600 cfm.

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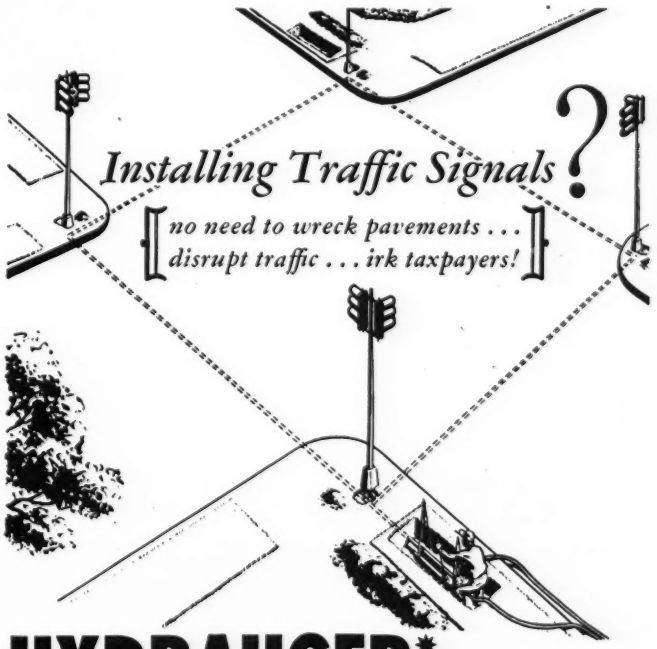

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CALENDAR

MARCH

Mid-West Gas Assn.—Hotel Fontenelle, Omaha, March 12-14.

National Assn. of Corrosion Engineers Conference & Exhibition—Hotel Statler, New York, March 13-16.

Western Metal Congress & Exposition—Civic auditorium and Exposition hall, Oakland, Calif., March 19-23.

Eastern Natural Gas Regional Sales Conference, Residential Gas Section—William Penn hotel, Pittsburgh, March 26-27.

Oklahoma Utilities Assn. Annual Convention—Mayo hotel, Tulsa, March 29-30.

New England Gas Assn. Annual Meeting—Hotel Statler, Boston, March 29-30.

APRIL

AGA Sales Conference on Industrial & Commercial Gas — Shoreham hotel, Washington, D.C., April 2-4.

Mid-West Regional Gas Sales Conference, Residential Gas Section—Edgewater Beach hotel, Chicago, April 9-11.

Southwestern Gas Measurement Short Course—University of Oklahoma, Norman, April 10-12.

AGA Distribution, Motor Vehicle, and Corrosion Conference—Hotel Peabody, Memphis, April 16-18.

Gas Appliance Manufacturers Assn. Annual Meeting—The Drake hotel, Chicago, April 16-18.

Florida - Georgia Gas Assn. Spring Convention — Hollywood Beach hotel, Hollywood Beach, Fla., April 19-21.

Southern Gas Assn. Annual Meeting—Biloxi, April 23-25.

National Conference of Electric and Gas Utility Accountants—Hotel Sherman, Chicago, April 23-25.

Indiana Gas Assn. — French Lick Springs, French Lick, Ind., April 26-27.

MAY

AGA Natural Gas Department Spring Meeting—Baker hotel, Dallas, May 7-8.

Missouri Assn. of Public Utilities—Jefferson hotel, St. Louis, May 7-9.

National Resturant Exposition—Navy Pier, Chicago, May 7-11.

AGA Production and Chemical Conference—Hotel New Yorker, New York, May 14-16.

AGA Industrial and Commercial Gas Section Industrial Gas School—William Penn hotel, Pittsburgh, May 14-18.

Pennsylvania Gas Assn.—Wernersville, Pa., May 15-17.

Public Utilities Advertising Assn. Convention—Hotel New Yorker, New York, May 17-19.

American Society of Refrigeration Engineers Spring Meeting—Hotel Statler, Detroit, May 27-30.

JUNE

Institute of Cooking and Heating Appliance Manufacturers Annual Meeting—Cincinnati, June 5-6.

AGA Executive Conference—Greenbrier hotel, White Sulphur Springs, W. Va., June 11-12.

Canadian Gas Assn.—Bigwin Inn, Lake of Bays, Ontario, Canada, June 18-21.

Michigan Gas Assn.—Grand hotel, Mackinac Island, Mich., June 25-26.

SEPTEMBER

Pacific Coast Gas Assn. Annual Convention — Fairmont hotel, San Francisco, Sept. 4-6.

OCTOBER

AGA Annual Convention—St. Louis, Oct. 15-18.

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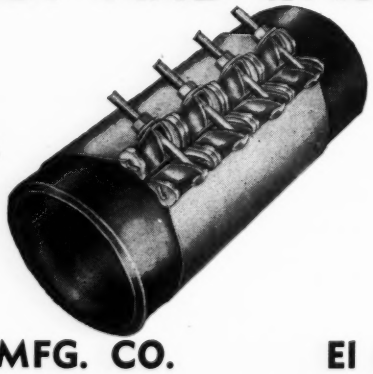

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ASSOCIATIONS

Last Month

Community Relations Vital Home Service Task

Some 200 home service and sales representatives who gathered in Washington, D. C. on Jan. 3-5 for the annual AGA Home Service Workshop heard one theme stressed by speaker after speaker: home service departments can and must establish favorable utility-community relations.

After a welcome from Vivian L. Marshall, New Orleans Public Service Inc., and chairman of the AGA home service committee, a symposium presented three methods of selling gas services to the public. Lone Star's Julia Hunter told how her company glamorized the blue flame as the industry's symbol; the importance of working with school and government educational leaders was outlined by Arra Sutton Mixter of Hartford Gas Co.; and Sue Herndon, Arkansas-Louisiana Gas Co., described her company's success in enrolling college home economics students as apprentices.

From outside the gas industry, Helen Kendall, Good Housekeeping Institute equipment editor, and Eugenia Hatcher, of General Foods Corp.'s homemaker testing service, told how to get the "consumer's angle."

Everett J. Boothby, Washington Gas Light Co., and Carl H. Horne, Alabama Gas Corp., addressed the delegates at the Jan. 3 luncheon, Mr. Boothby pointing out the effect of world conditions on home service work, and Mr. Horne discussing the relationship between home service and management.

Discussion techniques were demonstrated by 12 group leaders at an afternoon session, and at another gathering, Eleanor R. Morrison, Michigan Consolidated Gas Co., led a panel discussion on the home call.

Four presentations on various home service activities comprised a symposium on Jan. 5. Beatrice Wagner, Philadelphia Gas Works, described a department store promotion; a training program based on the Old Stove Round Up was outlined by Betty Frahm, Montana-Dakota Utilities Co.; Ruth Peacock, Michigan Consolidated, demonstrated a hat show as a Spring Style Show tie-in; and East Ohio's Dorothy Dean discussed means of educating dealer salesmen on gas appliances.

Portions of the highly successful Gasco Food Institute, Ohio Fuel Gas Co.'s traveling cooking school, were acted out by Mary E. Huck and several assistants.

Washington guests of honor and visiting state home economists were introduced at the last session by Jessie McQueen, AGA home service counsellor. Concluding the meeting, AGA President D. A. Hulcy reviewed the importance of community services for the home economists.

Reports of new association officers were still coming in last month.

At a meeting of the Oklahoma Utilities Assn.'s board of directors, C. N. Robinson, Public Service Co. of Oklahoma, was elected

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MAXITROL Gas Regulators definitely give you more for your money in performance and rated B.T.U. capacity!
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1951 president. He will be assisted by Richard W. Camp, Consolidated Gas Utilities Corp., first vice president; W. R. Wolfe, Oklahoma Gas & Electric Co., second vice-president; and H. H. Ferrin, OG&E, treasurer. Miss Kate A. Niblack, Oklahoma City, continues as secretary. The board also selected two three-year and six one-year directors.

Long-time Canadian gasman George W. Allen on Jan. 1 retired from his post as executive secretary and treasurer of the Canadian Gas Assn. after nearly 35 years of service. Warner A. Higgins, Toronto public relations consultant, was appointed to fill the vacancy.

G. W. Allen

Mr. Allen was associated with Consumers Gas Co. of Toronto for a number of years, later taking over as editor and advertising manager of the *Canadian Gas Journal*, a position he still holds. An active committeeman, Mr. Allen worked with the AGA and its predecessors, and until his retirement served as director of the Canadian association's Laboratory Approval Extension Division.

In Denver, the following officers of the Rocky Mountain Gas Assn. were re-elected at the annual meeting: President, Sam J. Neely, North Denver Furniture Co.; vice presidents, Dick Tanner, D. A. Tanner Co., and D. A. Bell, Bell Plumbing & Heating Co.; secretary-treasurer, Roy G. Munroe, Public Service Co. of Colorado.

R. A. Bissell, sales promotion manager, Bryant Heater Division, Cleveland, has been appointed chairman of GAMA's sales promotion committee, gas water heater division. As a member of the committee last year, Mr. Bissell was active in the Court of Flame campaign, and he is also currently serving on the AGA residential gas section's water heating committee.

More than 60 industry executives attended the quarterly meeting of the Independent Petroleum Assn. of America in Tulsa on Jan. 15-16. Of special interest to gasmen was a gathering of the IPAA natural gas committee on Jan. 14 with R. C. Kay, Amarillo, presiding as chairman. Economics and legislative problems affecting the natural gas industry were considered.

At it's 57th annual meeting in Philadelphia, Jan. 22-25, the American Society of Heating & Ventilating Engineers elected Lauren E. Seeley, University of New Hampshire, as 1951 president. Mr. Seeley is dean of the college of technology and director of the engineering experiment station. Other new officers are Ernest Szekely, Bayley Blower Co., first vice president; Reg F. Taylor, consulting engineer, second vice president; and Howard E. Sproull, American Blower Corp., treasurer.

Samuel R. Lewis, consulting mechanical engineer of Chicago, was awarded the society's 1950 F. Paul Anderson medal for outstanding contributions to the advancement of heating, ventilating, and air conditioning.

Coming Up

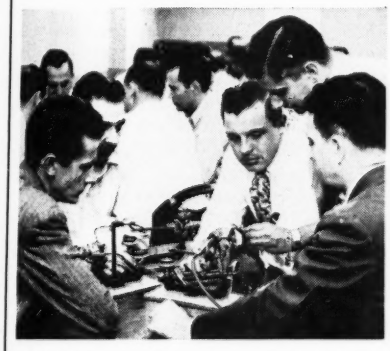
Industrial & Commercial Spring Events Planned

Washington's Shoreham hotel will be the scene of the annual AGA sales conference on industrial and commercial gas, April 2-4. F. T. Brooks, Philadelphia Electric Co., heads the committee in charge of the event.

A workshop presentation on commercial gas cooking, similar to the "Mr. Flameless and Mrs. Flame" demonstration, has been planned for commercial gas day, April 2. Other addresses tying in with the commercial program will deal with water heating equipment and relations with local restaurant associations.

April 4 has been designated industrial gas day, and some of the subjects to be discussed are "Radiant Heat in the Glass Industry," "Commercial Heat Treating," "Die Cast Metal Melting," "Special Uses for Radiant Tube Furnaces," and a two-part research presentation titled "Heat Treatment of Steel by Gas vs. Induction" and "Review and Forecast of Industrial and Commercial Gas Research."

Members of the Industrial and Commercial Gas section are hard at work on another event — the Industrial Gas School, which will be held at the William Penn hotel in Pittsburgh during the week of May 14. Terry Hart, chairman of the sales training committee, has announced that the school will be a five-day advanced and refresher course for industrial gasmen. Formal instructions for registration will be mailed out in the near future.



A field-tested traveling service school, designed to educate servicemen in the maintenance and servicing of temperature controls, is now available to any interested utility or organization. The Robertshaw and Grayson divisions of Robertshaw-Fulton Controls Co. have developed the school, which is transported in a converted station wagon and is completely equipped.

Servicemen spend the three-hour session actually operating controls with live gas, dismantling, adjusting, and rebuilding them under the supervision of factory-trained instructors. The course is available at no cost, and inquiries should be addressed to the sales department of Robertshaw Thermostat Co., Youngwood, Pa. or Grayson Heat Controls, Lynwood, Calif.

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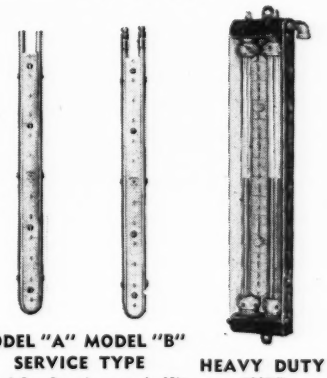
For Water, Mercury, Oil or Glycerine



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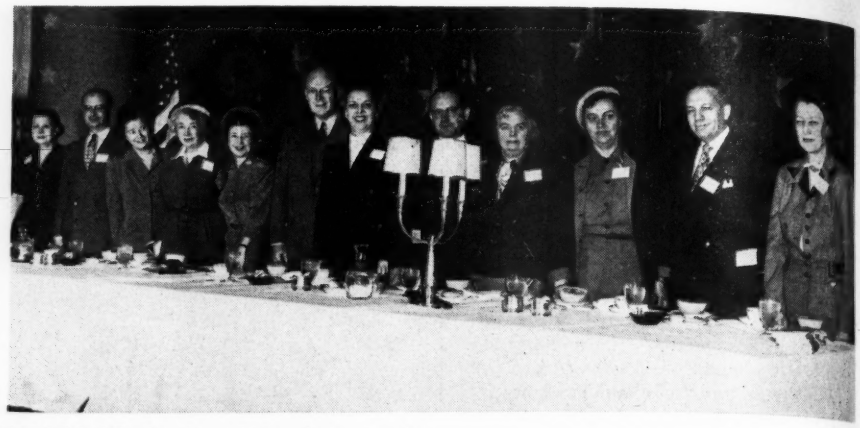
WANTED: GRADUATE HOME ECONOMIST EXPERIENCED in natural gas utility field to take responsible charge of new department in Albuquerque, New Mexico, one of the fastest growing cities in the Southwest. Must have pleasing personality, neat appearance, age 25 to 35. Guaranteed monthly salary, pleasant working conditions, numerous attractive employee benefits after period of regular employment. Submit abstract of experience, qualifications, employment history, to Mr. Tom Corr, District Manager, Southern Union Gas Co., Box 1692, Albuquerque, New Mexico.



SHOWN AT the Jan. 3 luncheon at the Home Service Workshop are (left to right): Jessie McQueen, AGA; Howard Noyes, Washington; Eugenia Hatcher, General Foods; Eleanor Morrison, Detroit; Ida Jean Kain, King Features; E. J. Boothby, Washington; Vivian L. Marshall, New Orleans; C. H. Horne, Birmingham; Helen Kendall, Good Housekeeping; Irene L. Muntz, Rochester; W .J. Schmidt, Long Island, and Ruth Sheldon, Washington. (See story on page 71.)

TRADE LITERATURE

DRESSER MANUFACTURING DIVISION, Bradford, Pa.—A new four-page catalog describes the company's four principal types of expansion joints—single end, double end, single end with limited movement, and double end with limited movement. Sizes range from 3-in. ID to 24-in. OD, larger sizes upon request.

EUTECTIC WELDING ALLOYS CORP., 40 Worth St., New York 13, N.Y.—To assist industry in achieving a rapid, full-scale response to defense needs, Eutectic has published a "Manual of Welding Engineering and Design," the first booklet in its national defense series. Additional printings will be made to meet industry and government needs. Copies are available from the company's Technical Information Service.

CARBOLINE CO., 7603 Forsyth Blvd., St. Louis 5, Mo.—Practical application of thick protective coatings for tank and duct linings and for protection of equipment and floors is covered in a bulletin on a new coating called Carbo-Kote 6020. Data sheet C-42 gives coverage, drying and working times, corrosion resistance, uses and prices.

SURFACE COMBUSTION CORP., Toledo 1, Ohio—Four bulletins have been issued recently. SC-149 describes pit-type, controlled-atmosphere furnaces; "Heat Treat Review" presents current technical and operating information on heat treating metallurgy and practice; the firm's line of standard rated atmosphere furnaces is discussed in SC-148; and SC-147 deals with rotary retort controlled atmosphere furnaces.

INDUSTRIAL METAL PROTECTIVES INC., 401 Homestead Ave., Dayton 8, Ohio—Corrosion resistance superior to conventional zinc coatings with cost savings is claimed for Zincilate, a one-coat, self-protecting, anti-corrosion coating described in a new technical bulletin. Case histories, specifications, and data on surface preparation and methods of application are presented.

JOHN INGLIS CO. LTD., 14 Strachan Ave., Toronto, Canada—Bulletin No. 4, "The Dayton-Faber System," describes the manufacture of Dayton oil gas or Faber reformed gas by partial combustion with air.

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DRILLING RIG: Important Tool Of the Gas Transmission Company

(See Cover)

The drilling rig shown on the Pipeline Section cover is not a new tool for gas transmission companies—but it's a tool that has almost overnight assumed new importance in the scheme of business. It isn't finding new gas supplies and it isn't pulling oil out of the earth; it's putting gas back in.

Symbolic of an unprecedented activity in the field of underground gas storage, the rig shown is one of many now at work on the biggest storage project to date—the Oakford field 25 miles east of Pittsburgh, where a "holder" is being carved out to store 105 billion cu ft of gas.

TEXAS Eastern Gas Transmission Corp. and New York State Natural Gas Corp. last fall embarked on a three-year program to guarantee winter comfort for natural gas users in the Appalachian, Eastern Seaboard, and New England areas, following FPC approval of the big Oakford storage project. To be owned and operated on a 50-50 basis, the field will cost an estimated $40 million to put in shape for its new job.

The field was formerly owned by Peoples Natural Gas Co., subsidiary of the Consolidated Natural Gas Co. (as is New York State). In operation, the field will service Consolidated companies in Ohio, western Pennsylvania, and parts of New York, as well as Texas Eastern's customers in the same areas and in New Jersey, eastern Pennsylvania, and New England —if and when FPC okays the application of Algonquin Gas Transmission Co., a Texas Eastern affiliate, to distribute Texas Eastern gas in the northeast.

The field will have, in the first phase of development, an ultimate total capacity of 105 billion cu ft. Of this total, 45 billion will be base gas and 60 billion will be circulating or "top storage" gas. Deliverability will be approximately 400 MMcf on peak withdrawal days. Texas Eastern and New York State Natural will each be entitled to take 50%.

The Oakford field is one of the largest and oldest natural gas fields in the Appalachian area, but has been depleted of substantially all of its original gas since 1908. Peoples Natural has been using the field for several years for storage of gas on a relatively small scale.

Oakford actually comprises two separate fields, North Oakford and South Oakford. Only North Oakford is being developed in the first phase of the storage project.

North Oakford covers some 6000 acres in Westmoreland county, Pennsylvania, in Salem, Hempfield and Penn townships north of the town of Jeannette. In spite of the size of the field, its limits have been accurately defined by a series of dry holes, and the storage sands have been sealed off. There are three former producing zones in the reservoir: the "Fifth and Bayard" sand at 2200-ft depth, the "Murrysville" sand at 1600 ft, and the "Bradford" sand at 3000. The latter has been judged not suitable for storage; operations will be limited to the first two.

Development will require the re-plugging of about 40 abandoned wells, the reconditioning of 111 present wells, the drilling of approximately 60 new wells, and the installation of field lines. Largest single construction item in the Oakford storage project will be the building of a 30,000-hp compressor station for injection and removal.

To bring natural gas from the southwest to the new field necessitated the laying by Texas Eastern, of 35 miles of 30-in. pipe from a connection with the Inch lines in Fayette county in southern Pennsylvania. This same line will receive winter deliveries from Oakford.

New York State Natural was authorized to build a 70-mile, 20-in. line from Oakford to connections with the distributing systems of Peoples and the East Ohio Gas Co., Cleveland.

SUPERVISOR of the Oakford job is Edward C. Ingraham (center), assistant superintendent of transmission and production for Peoples Natural. At left is Roy Swauger, chief clerk; at right is Carl A. Spencer, district superintendent.

Included in the joint project are a district office and warehouse at Jeannette at the southern end of the field. A pipe and casing storage yard has already been set up there.

Some of the drilling and reconditioning work was done by Peoples Natural last summer prior to the transfer of the properties to the new owners, but the major portion of the work remains to be done. This past summer also saw some gas injected by Peoples into the field, but the amount, compared with the ultimate goal, was slight. Peoples retained the right to withdraw gas from the field this winter to meet its peak demands. Really large-scale injections of gas into the field will commence upon completion of the 30-in. link between the field and Texas Eastern's main line.

Statistics on Texas Eastern's and New York State Natural's new storage project are formidable. In the case of Texas Eastern it will represent the largest single storage pool on the system of a long distance interstate pipeline company. At peak capacity it is estimated that Oakford will require approximately $20 million worth of natural gas. The 200 MMcf which Texas Eastern will be able to draw daily is approximately equal to all its present pipeline deliveries east of Oakford in Pennsylvania (including Philadelphia), New Jersey and New York.

Under normal operating conditons, of course, the Oakford pool will be drawn on only during peak periods and for limited amounts, but during a prolonged emergency the 60 billion cu ft of circulating natural gas could supply the full needs of many eastern cities. For instance, this one reservoir could support the entire gas requirements of 25 cities like Providence, R.I. and its suburbs, with populations of over 390,000 each, for 150 days.

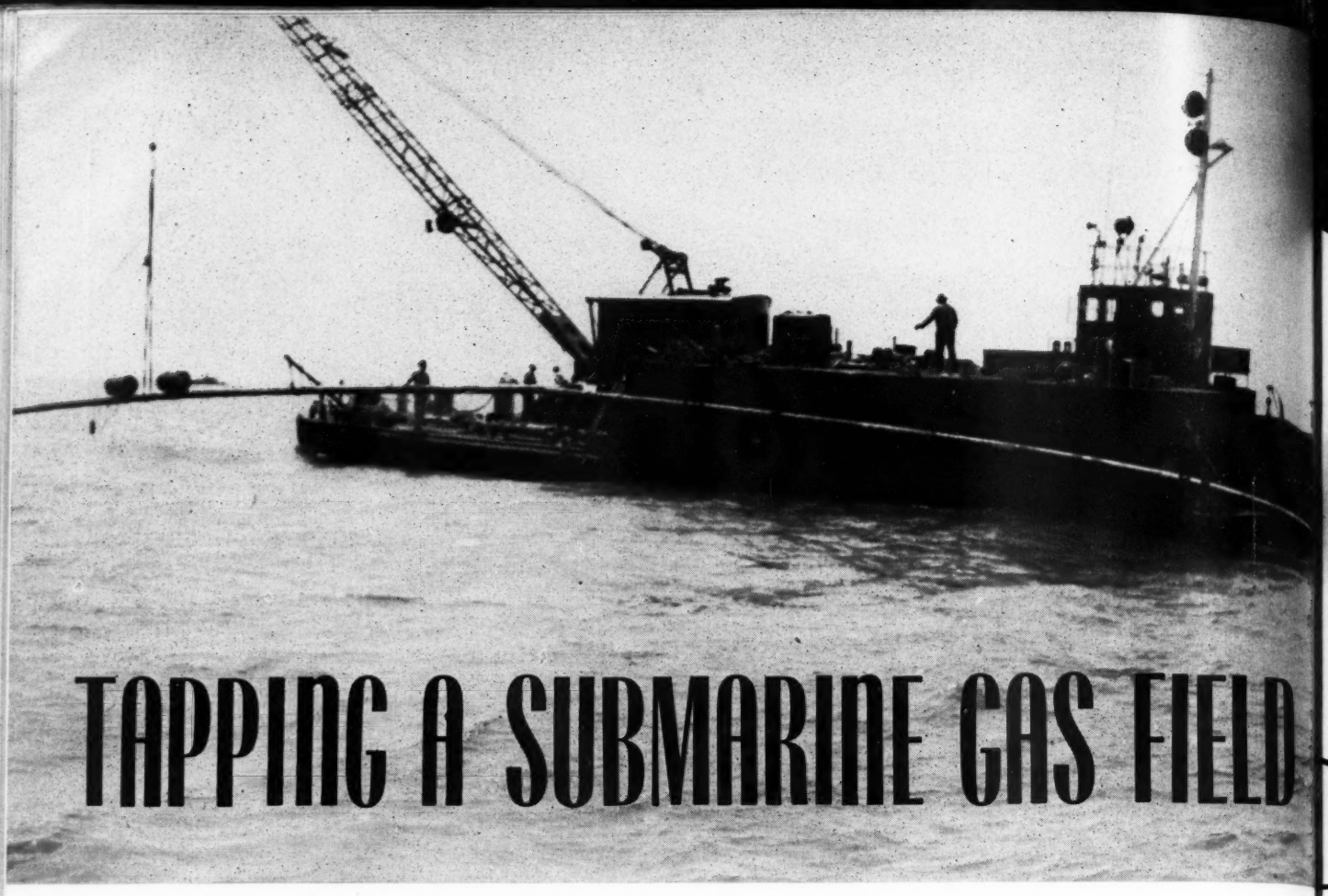
The Oakford project is unusual in that it combines the resources of a southwestern transmission company, Texas Eastern, and a large distributing system. However, it is typical of the increasing emphasis that most natural gas companies are placing on underground storage as an effective means of ironing out valleys and peaks in pipeline operations.

New evidence of this emphasis continues to pile up. Only last month FPC accepted for filing three new storage plans (see Pipeline News). Transcontinental Gas Pipe Line Corp., whose new line is delivering gas to New York City, is admittedly investigating water-holding fields close to markets. Peoples Gas, Chicago, has for several months been running tests on Illinois formations.

Everybody's doing it. The Wall Street Journal *surveyed the situation recently, found that in 1940 only 19 storage fields were in use. Now there are more than 100. In 1945, about 70 billion cu ft went back into the ground; today the figure is closer to 250 billion. Of the $3 billion to be spent by the gas industry over a five-year period, about half will go for underground storage.*

Consumers Power Co., Jackson, Mich., says the Journal, *will get as much as 93% of its supply on a peak day from its storage fields.*

Storage is mighty big business.



TAPPING A SUBMARINE GAS FIELD

Unique Pipelining Methods Devised For Laying First Gulf Gathering Lines

By ROBERT C. LEDFORD

Robert C. Ledford, operations manager for The Marine Gathering Co., was formerly construction and maintenance superintendent for McCarthy Chemical Co., Winnie, Texas, and has some 20 years' experience in design and construction of chemical plants, gasoline plants, and gas gathering systems. He attended the Missouri School of Mines, Rolla, Mo., where he studied mechanical engineering.

WHEN the major oil companies first completed gas-gas condensate wells in their exploration of the Continental Shelf off Texas and Louisiana, the problem of transporting this production ashore became one which gave pause to their engineers and management. A number of questions arose to which satisfactory answers had to be found before any effort could be made to realize returns on the invested capital.

Exclusive

First, a satisfactory method of laying the line itself had to be devised. Techniques developed through years of experience on land were not practical when dealing with the vagaries of wind and tide in the unprotected reaches of the Gulf of Mexico. Second, if such technique for marine pipeline installation could be developed, the problem of corrosion was such as to require serious consideration. Third, whatever means of protection was devised to prevent corrosion must in itself be protected from the attack of marine organisms. Fourth, once the line was installed and properly protected, a hazard from marine traffic had to be guarded against.

Houston Men Affiliate

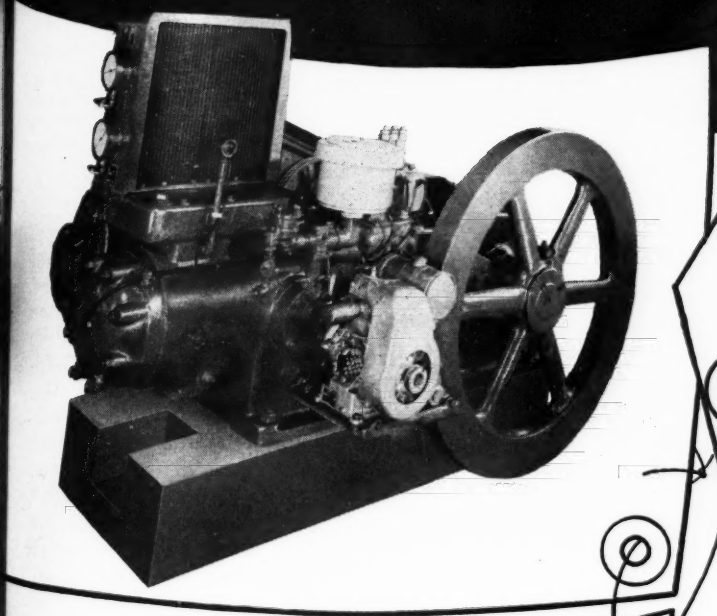
All of these problems were given a great deal of study before The Marine Gathering Co. was formed by a small group of enterprising Houston businessmen and engineers. John H. Blaffer, president of the Commerce Oil Co.; G. Burton Liese, an investment banker, and Mr. Philip C. Dixon, a consulting engineer with many years of experience in the gas business, affiliated to form the new company.

PHOTO at top of page shows weld completed and line ready to be lowered to Gulf floor.

Gas Supply Assured

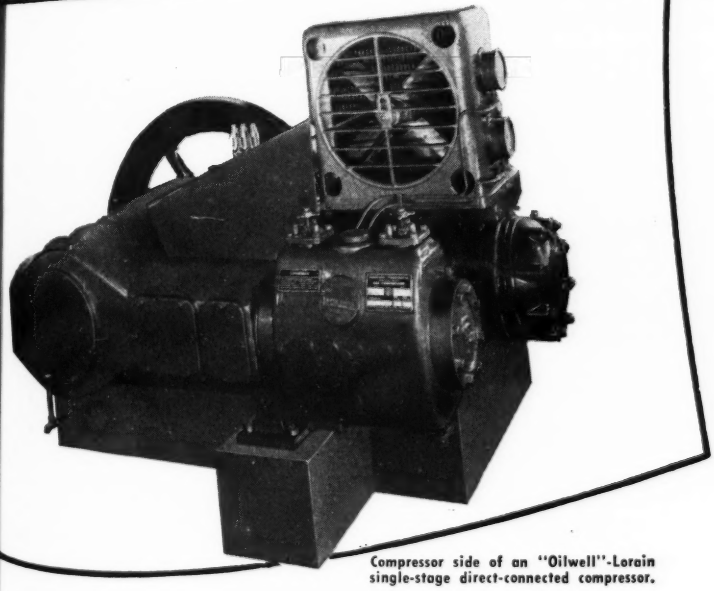
After successfully negotiating contracts for purchase of gas from the Pure Oil Co.'s leases off Cameron and Vermilion parish, Louisiana, they were able to conclude an agreement with Tennessee Gas Transmission Co. for sale of this gas, once it had been brought ashore and properly processed by them for use as a fuel gas.

The writer was appointed operations manager for the new company and de-



Engine side of an "Oilwell"-Lorain single-stage direct-connected compressor.

GAS LIFT PRODUCTION
RECYCLING OF GAS
SECONDARY RECOVERY OF OIL
UNDERGROUND STORAGE OF GAS
GAS TRANSMISSION



Compressor side of an "Oilwell"-Lorain single-stage direct-connected compressor.

BRIEF SPECIFICATIONS — 30 HP Unit

	Single-Stage	Two-Stage
Operating Speed Range	250-450 rpm	
Cooling System (engine)	Radiator Type	
Cooling System (compressor)	Radiator with pump	
Compressor Bores	To customer specification	
Engine Bore and Stroke	9½" x 10"	
Height	48"	62"
Length	136"	149"
Width	39"	39"
Net Weight	6500 lbs.	8000 lbs.

20·30·40·50 HP available in both single and two-stage

"OILWELL"-Lorain Direct-Connected Compressors handle gas at the pressures required by the Oil and Gas Industry as compressors, gas boosters and vacuum pumps.

THESE FEATURES WILL INCREASE EFFICIENCY IN YOUR GAS-BOOSTER OPERATIONS

COMPACTNESS — The compressor, of these new type "Oilwell"-Lorain units, is "direct-connected" with the engine; making a complete one-piece gas compressor station ready for immediate service.

DEPENDABILITY — "Oilwell"-Lorain Compressors are designed to withstand hard, continuous service with a minimum of attention and maintenance.

FLEXIBLE POWER END — Single-cylinder, two-cycle Lorain Engines are designed for operation on natural gas, propane or butane. Conversion to diesel operation can be accomplished easily and quickly.

Contact your nearest "Oilwell" representative and ask for our latest compressor literature. Your "Oilwell" representative is always ready and willing to provide technical assistance in analyzing your compressor needs.

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USS "OILWELL"

UNITED STATES STEEL

tailing of design and installation were begun. In view of the fact that it would be necessary to have a considerable negative buoyancy (to insure maximum stability of the line in shifting currents), it was decided that, rather than spend money for conventional river clamps for dead weight, heavy wall pipe would be purchased, thereby obtaining the necessary dead weight as well as additional wall thickness in case of excessive corrosion. The pipe selected for the 8.44-mile submarine line was 8-in. schedule 60 seamless API-5LX which weighed 38.25 lb per ft. Mill inspection was rigorous and many lengths of pipe were rejected by the inspectors.

Coating and Wrapping

To provide protection against corrosion, it was decided that the pipe should have the following type of coating and wrapping:

1. Mechanical cleaning (revolving wire brushes)
2. One coat PC&C plasticized primer
3. One 3/32-in. coat PC&C plasticized enamel
4. One wrap Owens-Corning Fiberglas
5. Second coat 1/16-in. PC&C plasticized enamel
6. One wrap Owens-Corning Glasfelt
7. One wrap 70-lb Kraft paper

Pittsburgh Coke & Chemical Co.'s plasticized primer and enamel were selected for coating because, in addition to ease and uniformity of application, it remains pliant and plastic in the cold sea water, eliminating cracking and chipping when the pipe is flexed. Owens-Corning's Fiberglas and Glasfelt wrappings were chosen because of excellent dielectric qualities and because their porosity allows them to become thoroughly impregnated with the hot enamel while wrapping, thus bonding the layers of wrapping into a homogeneous mass.

Cathodic Protection

In addition to the coating and wrapping described above, it was agreed that cathodic protection would be needed on the line to protect against corrosion, should at some future time some unknown factor cause the coating to be damaged or cause its deterioration by chemical means. The success of the Cathodic Protection Service Co. of Houston in protecting offshore structures and ships and barges led Marine to select them for the design and installation of this portion of the project. Since it was not feasible to use rectified electrical current for this installation, it was decided that a sacrificial anode system would be adopted. Protection was calculated and designed so that magnesium anode beds at the extreme ends of the line would provide sufficient potential for requirements, and would make for ease of replacement.

Enamel Coating

Once these important details were settled upon, the question of defeating marine organism attack had to be faced. Experience of the United Gas Co. in Lake Ponchartrain, Louisiana, and the Aluminum Corp. of America at Point Comfort, Texas, had shown that barnacles would attack and destroy any conventional type of pipe coating.

The idea of impregnating wrappings with a coating enamel containing copper-bearing salts to repel marine organisms was suggested. It was felt it might be possible to develop an emulsion of coal tar and copper oleate. In order for such a coating to be effective in repelling marine organisms, however, it would be necessary that the copper salts slowly be leached from the coating; and, because of this leaching action, within a period of a few months the repellent would be exhausted.

Line Depth Studied

Experience in the past in New Jersey, North Carolina, and Trinidad, had shown that barnacles and other related marine organisms do not thrive at the level of the ocean floor, and below the mud line are practically nonexistent. Inquiry into the reason for this fact showed that barnacles exist on plankton, a microscopic marine animal which does not exist in the mud of the ocean floor. Therefore, it seemed logical that the best protection for the coating and wrapping of the pipe could be provided by burying the line to a depth of approximately 3 ft.

All of the above details of design and construction having been decided upon, it became necessary to find a construction organization capable of carrying out the plan. It was evident that the Submarine Pipeline Construction Co. of Port Lavaca, Texas, had had considerable experience in the laying of lines in the bayous and inlets in the vicinity of Matagorda Bay. In addition to having developed a laying technique which promised to be effective in the Gulf of Mexico as well as the protected waters of Matagorda Bay, the company had also perfected and patented an underwater trenching machine which made possible the burying of the line in the 40 ft of water around the Pure Oil Co.'s platform off Rollover bayou.

TYPICAL pontoon installation on line.

Laying Technique

Essentially, Submarine's laying technique consisted of welding together lengths of pipe on shore, installing pontoons on the line sections to give buoyancy for towing; then launching the pontooned pipe, towing it to the line location and removing pontoons to lower the line to the bottom. Methods of attachment of the pontoons to the line, launching and towing of the pipe sections, and welding and lowering of the pipe sections had been worked out in a satisfactory manner.

The line location was to be at a place quite remote from any cities along the southwestern coast of Louisiana. For example, the nearest town, which is Cameron, La., is almost 50 miles to the west, while Abbeville is almost an equal distance to the northeast. To further contribute to the difficulty of supply and communications, all of the land imme-

diately behind the beach is marsh land through which the only mode of travel is by mud boat.

Camp Site Selection

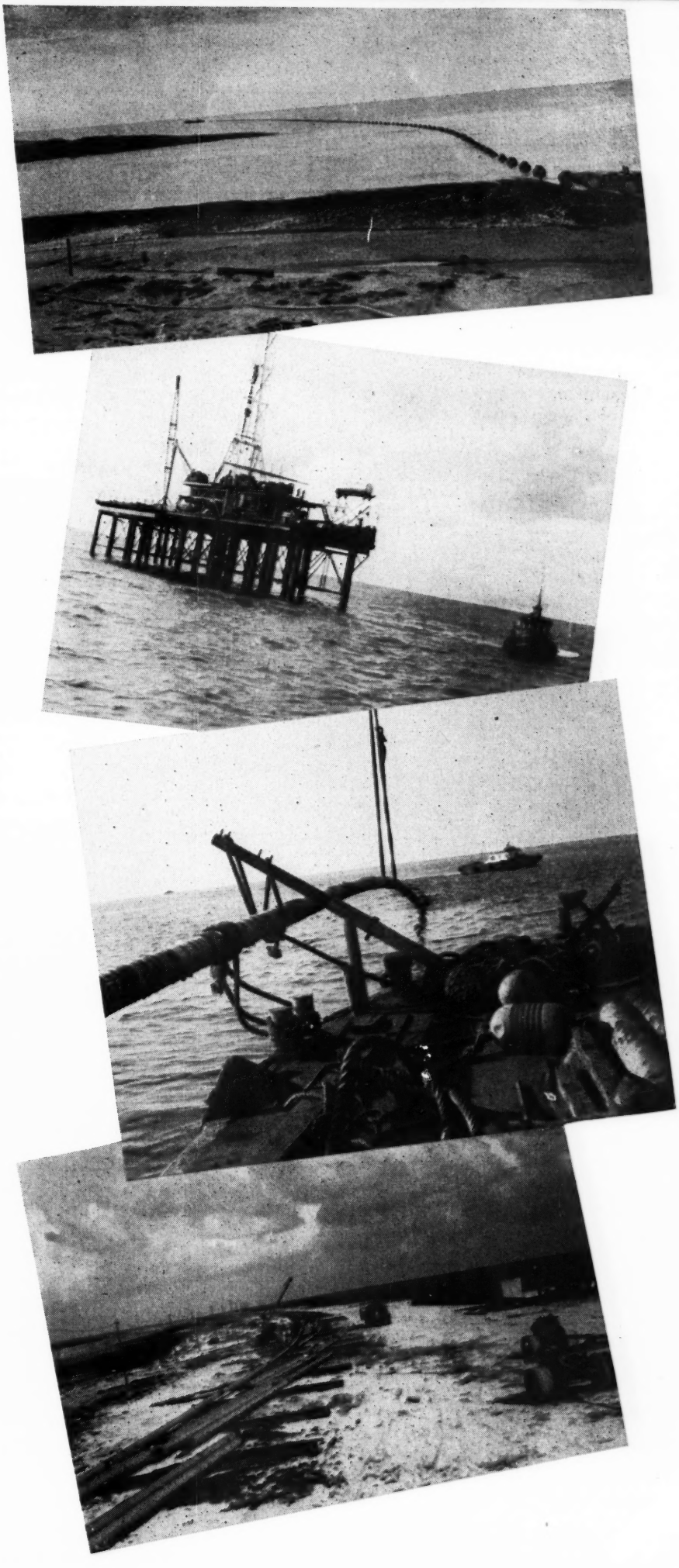
It was necessary to select a site for the construction of the pipe sections which would meet the following requirements:

1. A beach at least 4 ft above normal high tide with a minimum of available straight length of 2000 ft for the stringing of the pipe sections.
2. An adjacent bayou or canal having sufficient water depth to allow the entrance of the construction vessels in case of rough weather or hurricanes.
3. An access canal to the mainland through the marshes behind the beach which would make it possible to transport men, materials, and supplies from the nearest road to the beach.
4. A point which would be as near as possible to the line location so as to minimize the time spent in towing the pipe sections to an ultimate destination.

The above requirements represented a large order and it was necessary for the writer and Sammy Collins of Submarine to make preliminary survey by land, sea, and air before selecting such a site. It was finally determined that the one location available which would most nearly meet these requirements, at Joseph's Harbor bayou, had the unfortunate feature of being some 15 miles by water away from the line location. This bayou, in addition to having sufficient water depth to allow entrance of the construction equipment, had been deepened several years previously by one of the major oil company's doing exploration work so that it was possible to reach by boat an improved roadway leading to Creole and to Lake Charles in a very few minutes.

Good Beach Found

The beach immediately west of the entrance to the bayou was excellent, having a minimum width of some 100 ft and being straight and unobstructed for several miles. All of the necessary equipment for establishing a construction camp at this remote spot was loaded on barges by Submarine at Port Lavaca,



TOP: Launching of pipe into Gulf from construction site.

SECOND: Pure Oil Co.'s "Roll-over" platform where gathering line connects to wells.

THIRD: New section of line picked up and placed in position for welding on LCT.

BOTTOM: View of beach construction camp showing pipe on sills ready for welding.

Texas and, accompanied by a converted LCT, a 500-hp river tugboat, and two 200-hp LCVP's, traveled through the intercoastal canal to Lake Calcasieu, thence out through Calcasieu Pass at Cameron, La., into the Gulf of Mexico.

Moving Equipment

All the equipment traveled coastwise in the gulf to Joseph's Harbor bayou, arriving there July 27 without incident.

Immediately, equipment and supplies were unloaded from the barges and a beach camp was established. While power poles were being erected for lighting and a portable light plant was being installed, the tug was sent back to Ellender Ferry with a barge to load the pipe for the project, which had been coated and wrapped at that location.

The following two weeks were consumed in welding the 40-ft lengths of pipe into 1100-ft sections, hydrostatically testing for detection of leaks, wrapping the welded joints, and retesting the coating with a Stearn's holiday detector.

Launching Method

The pipe was launched for towing to the line location in sections which varied between 3300 and 6600 ft depending upon the weather conditions prevailing at the time of launching. The method of launching was as follows:

1. Two side-boom caterpillar tractors would lift a section of pipe from the construction sills to a series of rubber-mounted rollers placed closely adjacent.
2. Oil drums carrying 10 psi internal pressure, to insure against internal collapse, were strapped to the line at necessary intervals to provide the desired buoyancy. (Special cutting devices were installed on the banding so that the barrels would be released when the line was in position.)
3. A bull plug was installed on the front end of the section, and a 2-in. manila hawser attached for towing.
4. A side-boom tractor was tied on the back end of the section and moved forward parallel to the line, pushing the buoyed section laterally on the rollers out into the waters of the gulf.
5. The tug boat picked up the hawser and assisted the tractor in pulling the line section into the water until the end of the pipe had been carried forward to the point where the front end of the section had originally lain.
6. The side-boom tractors moved another 1100-ft section over to the rollers, at which time the ends of the two sections were welded together, and the above procedure repeated.

When the line section had been safely launched and was on its way to the pipeline location, the converted LCT (it was used as a combination work barge and crew quarters) would head to the line location, anchor itself to a position for connecting line sections, and lift from

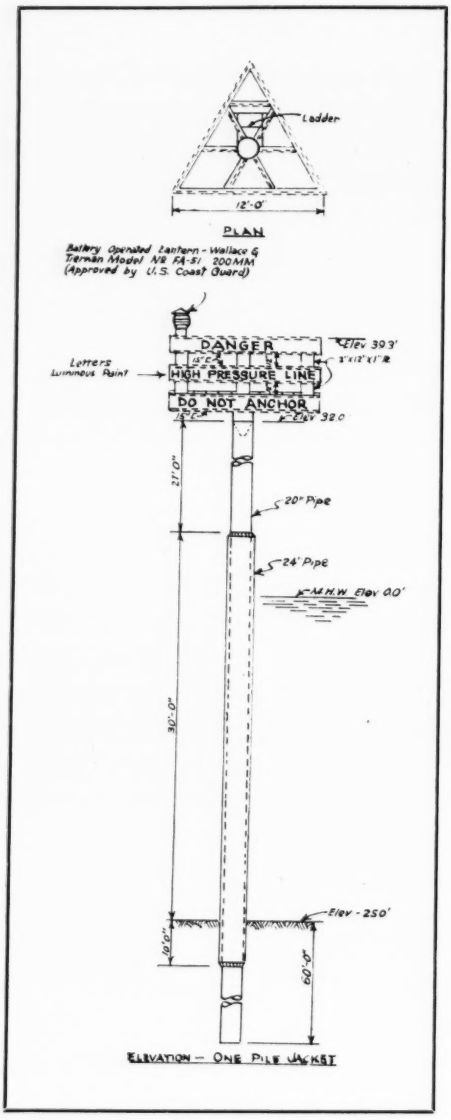


Fig. 1. Cross-section of pipeline marker.

the ocean floor the end of the previously laid section to prepare for the connecting weld.

By the time this preliminary work had been completed, the tug towing the pipe section would be ready to transfer the lead hawser to the LCT. Upon releasing the lead hawser, the tug would retrieve a like hawser installed on the opposite end of the section and proceed to pull the pipe section into proper alignment for releasing. By means of radio, the tug could be lined up with range poles on the beach through the use of binoculars from the bridge of the LCT.

Settling the Line

Immediately upon completion of the connecting weld, small LCVP's would begin removing the barrels from the end of the line closest to the new connection, allowing the line to settle to the bottom. As quickly as all barrels were removed from the section, the tug would release its hawser, properly buoyed so as to make recovery easy, and all the boats would assist in gathering the pontoon barrels for return to the construction site.

"Cow Catcher"

An ingenious device was installed on the bow of the LCT which made recovery of the bulk of the barrels very simple. A "cow catcher" made of galvanized open grating was attached to the LCT on its trailing edge about 3 in. above the water line. The leading edge was attached to the deck of the LCT with adjustable chains so that the grating projected horizontally forward, approximately 2 in. above the water line. Since the barrels, when released, tended to follow each other in a downwind direction, they would almost invariably form a straight line. It was therefore possible to sail the LCT along this straight line without any maneuvering, and the forward speed of the ship would cause the barrels to roll up on the grating. Deck hands would catch the barrels as quickly as possible and pass them up to the deck for storage.

Line Markers

The line was connected at the platform end through means of Chiksan marine swing joints. It was felt that by providing a flexible connection to the platform the danger of stressing the pipe, due to any swaying of the platform in rough weather, could be eliminated.

Upon completion of the line proper, the cathodic protection described above was installed. This left only the necessity of locating the pipeline markers to complete the installation.

These markers, as shown in *Fig. 1*, consist essentially of a single 20-in. steel pipe pile, jacketed from the mud line to a point above high water with a 24-in. steel jacket. A triangular-shape structure is placed on top to support warning signs and to give necessary floor space for the installation of battery-operated flasher lights.

Toughest Problem

In conclusion, it might be mentioned that the greatest single difficulty incurred was the vagaries of wind and tide. Strong currents at various times made it almost impossible to align the pontooned pipe for sinking. Hurricanes and threats of hurricanes caused cessation of operation on three different occasions; however, all of the above difficulties were coped with and made feasible the installation of offshore gathering systems. The work was completed without a lost-time accident and without serious damage to material or equipment.

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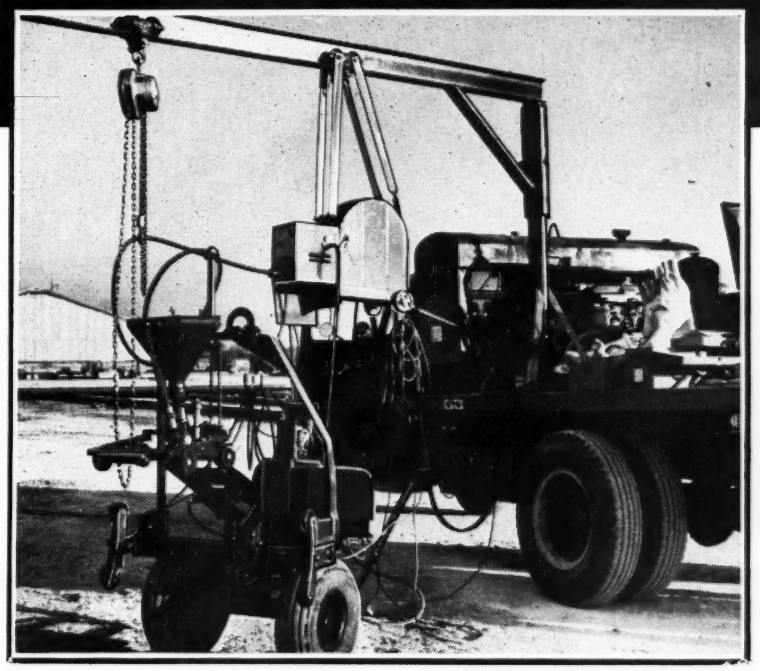

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The O. R. Smith organization has made an entirely new approach to the problem of double-jointing and sectioning all sizes of pipe from 4 inch to 36 inch under "firing line" conditions. The primary aim has been to develop an economical, yet effective method of sectionizing pipe, with the smallest possible amount of equipment to maintain lightness and mobility in the field. This aim has been achieved to a remarkable extent when it is realized that the whole rig is about one-tenth the weight of the equipment previously used for doing the same work.

The effectiveness of the equipment was recently demonstrated at the Brown & Root pipe yard at Greens Bayou, Houston, when over 100 sample welds were produced using 40 foot lengths of 16" pipe. As the welding is carried out entirely by the submerged arc process without any tacking or hand stringer bead, a higher degree of uniformity and quality is obtained than when submerged arc welding is used in conjunction with a manual stringer bead.

The actual welding operation is simplified by several automatic and self adjusting features on the equipment. The height of the weld above the surface of the pipe, the width, and the penetration on the inside of the pipe, may be regulated by various combinations of these adjustments in addition to the welding speed, amperage, and voltage, etc.

Numerous tensile tests have been made on welds produced by this process, which show that the welded metal is invariably stronger than the pipe, and a Bend Test of 180 degrees has no effect on the weld. There is no weakening of the pipe adjacent to the weld as the inside of the pipe is protected from sudden chilling by the internal line-up clamp, and the heat retained by the clamp gives the next joint of pipe a preheating which is desirable when welding while the atmospheric temperature is low.

Examination of the micro-structure of the welds indicate perfect fusion has taken place between the pipe and the weld. As the second pass follows immediately upon the first, the metal does not have a chance to cool, and the relatively high amperage produces sufficient heat to penetrate about two-thirds of the way into the first weld, while the heat retained by the protective coating of slag completes the normalizing process to give the weld strength and ductility.

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DOUBLE JOINTING WITH SUBMERGED ARC SEMI-AUTOMATIC WELDING EQUIPMENT

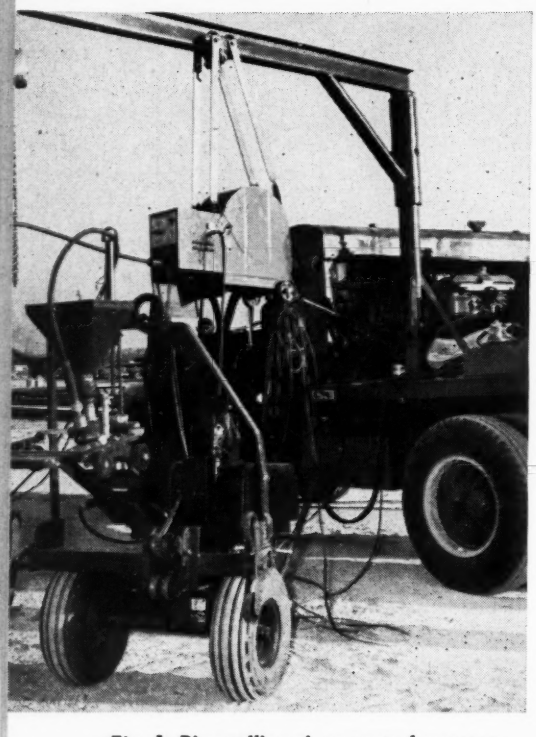
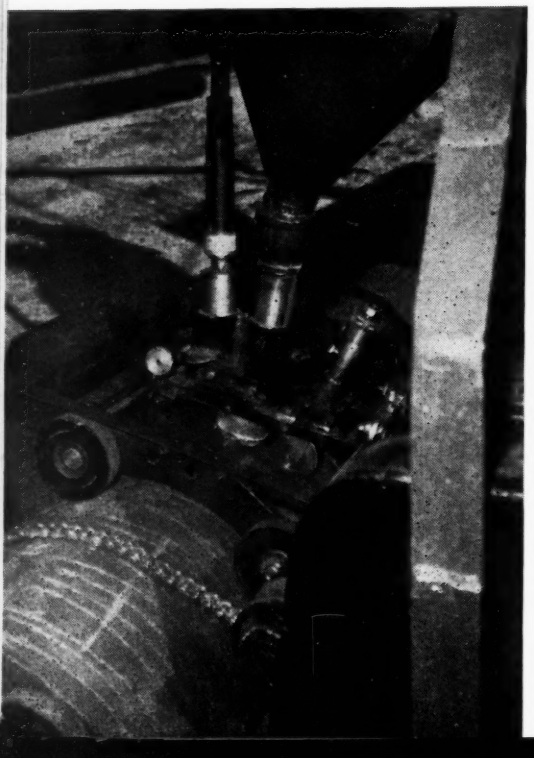


Fig. 1. Pipe rolling rig mounted on pneumatic tires. An electric motor provides the driving power.

Fig. 2. Pipe is supported on dollies to reduce rolling friction and to prevent spiral motion as pipe is rotated.



By C. A. RENTON

AN entirely new approach to the problem of double-jointing and sectionizing of all sizes of pipe from 4-in. to 36-in. under "firing line" conditions has just been announced by O. R. Smith of Houston. The primary aim has been to develop an economical, yet effective method of sectionizing pipe, with the smallest possible amount of equipment to maintain lightness and mobility in the field. This aim has been achieved to a remarkable extent when it is realized that the weight of the whole rig is about one-tenth the weight of the equipment previously used for doing the same work.

The effectiveness of the equipment was recently demonstrated at the Brown & Root pipe yard at Green Bayou, Houston, when more than 100 sample welds were produced using 40-ft lengths of 16-in. pipe. As the welding is carried out entirely by the submerged arc process without any tacking or hand stringer bead, a higher degree of uniformity and quality is obtained than when submerged arc welding is used in conjunction with a manual stringer bead.

The unit, shown in *Fig. 1*, consists of a pipe rolling rig mounted on pneumatic tires. An electric motor with speed reducer provides the driving power through a chain which encircles the pipe. In *Fig. 2* the pipe is supported on dollies designed to reduce rolling friction to a minimum and to prevent spiral motion as the pipe is rotated. A self-adjusting arm, which is an integral part of the main frame, allows the welding carriage to ride on the outside surface of the pipe. A frame within the carriage, which has lateral adjustment, provides a mounting for the welding gun and the flux box. The welding rod is correctly positioned by a guide roller which runs in the bevel between the two joints of pipe during rotation. A flexible hose connects the welding gun to the feed head, and the correct amount of rod is automatically regulated in proportion to the welding amperage.

One 600-amp welding machine is mounted on a 3-ton truck to provide the power for welding and the rolling rig. (See *Fig. 1.*) After a weld is made, the rig is rolled by hand to the next joint followed by the truck, but on long hauls or on rough ground, the rig is lifted by a hoist mounted on the truck boom.

The operating crew consists of one welder and a line-up man, a truck driver and helper with one clamp operator. The average number of welds produced per day depends on the size of the pipe, but with two line-up crews, the number of welds can be increased proportionately. On the test made in Houston, five joints of 16-in. pipe each 40 ft long were welded into one section of 200 ft, but the number of joints in a section need only depend on the total length which is most practical to handle.

The actual welding operation is simplified by several automatic and self-adjusting features on the equipment. The height of the weld above the surface of the pipe, the width, and the penetration on the inside of the pipe may be regulated by various combinations of these adjustments in addition to the welding speed, amperage and voltage, etc.

Numerous tensile tests have been made on welds produced by this process, which show that the welded metal is invariably stronger than the pipe, and a bend test of 180° has no effect on the weld. There is no weakening of the pipe adjacent to the weld as the inside of the pipe is protected from sudden chilling by the internal line-up clamp, and the heat retained by the clamp gives the next joint of pipe a preheating which is desirable when welding while the atmospheric temperature is low.

Examinations of the micro-structure of the welds indicate perfect fusion has taken place between the pipe and the weld. As the second pass follows immediately upon the first, the metal does not have a chance to cool, and the relatively high amperage produces sufficient heat to penetrate about two-thirds of the way into the first weld, while the heat retained by the protective coating of slag completes the normalizing process to give the weld strength and ductility.

Mr. Smith is chief engineer for Hauser Pipe Line Equipment Inc., Fort Worth.

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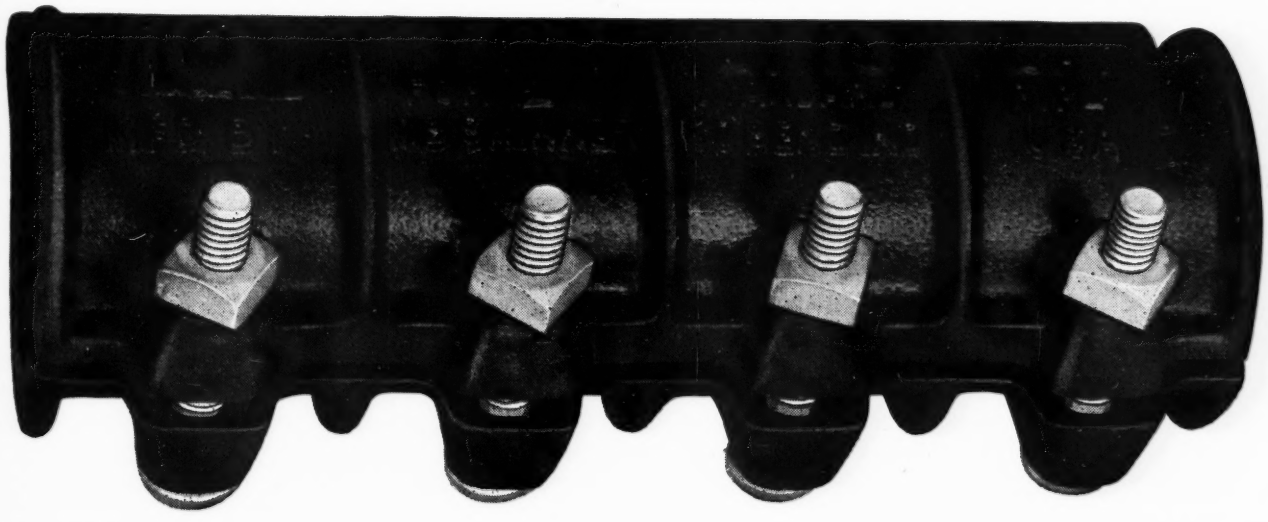

PIPELINE NEWS

Underground Storage Activity Spurts

Sudden new interest in underground storage was evidenced last month when three major companies filed plans for developing such areas with the Federal Power Commission.

Tennessee Gas Transmission Co., recently certificated to carry gas to New England for distribution, is asking for approval of a scheme to develop a field in an as yet unannounced location which would supply an extra 200 MMcf per day for peaks. At a cost of $51 million, TGT would, in addition to setting up the storage area, build 438 miles of loop on its Buffalo and New England extensions, add compressor units aggregating 44,000 hp in existing and authorized stations; install 14,000 hp in a new station.

The field and the new capacity would boost deliveries by 240 MMcf per day. Northeastern Gas Transmission Co., New England subsidiary, would receive 194 MMcf, and 46 MMcf would be placed in storage initially, for eventual sale to undesignated customers.

The second application came from Mississippi River Fuel Co., which would spend $2 million to develop a reservoir in the Waterloo, Ill., oil field. Two formations, which must be extensively tested, appear suitable for storage of a total of more than 17 billion cu ft at 14.7 psia. Twenty-five wells must be drilled and appurtenant facilities constructed.

Temporary authorization to make the tests has been given.

A third company, Texas Gas Transmission Corp., applied to the commission for approval of a $939,000 underground storage program to be developed at the Alford field near Petersburg, Ind. When completed, the field would hold 4 billion cu ft of gas and the project would enable the company to supplement its peak deliveries by 30 MMcf daily.

Proposed construction to prepare the field for use includes 12 miles of lateral line from the company's system in Indiana to the field; 4½ miles of storage field lines; a measuring station; and a 1200-hp compressor station.

Work can begin about March 1, the company stated, and it must be completed and the field repressured by next November so gas from storage will be available to meet peak demands during the 1951-52 winter.

FPC Affirms Examiner's Approval of Piedmont Plan

The initial decision which gave Piedmont Natural Gas Co. Inc., Spartanburg, S. C., a green light on its construction program (*GAS*, January, p. 84) was affirmed by the Federal Power Commission last month.

Under terms of the certificate, Piedmont will build laterals from the Transcontinental Gas Pipe Line Corp.'s New York line to serve markets in North and South Carolina.

The examiner's decision as it affected both companies was adopted in full, except that the commission held that Piedmont Gas Co. Inc., South Carolina Electric & Gas Co., and four South Carolina cities should have an opportunity to submit further evidence in support of their pleas for Transco gas.

In accordance with the examiner's recommendation, hearings on the Carolina Natural Gas Corp. and Public Service Co. of North Carolina cases will be reopened Feb. 20. Original applications of both companies were denied, but they now have an opportunity to set up new programs eliminating service to cities which Piedmont is authorized to serve.

Texas Gas Would Spend $42 Million On System

Texas Gas Transmission Corp., Owensboro, Ky., has announced a $42.3 million pipeline construction program designed to meet increasing needs for natural gas in its Midwestern and Appalachian markets.

Its application to the FPC asked for authority to build 564 miles of main and loop lines in Louisiana, Arkansas, Mississippi, Tennessee, and Kentucky to supply an additional 20 MMcf per day to Louisville Gas & Electric Co. and 95 MMcf to The Ohio Fuel Gas Co. Facilities would include a 195-mile, 24- and 26-in. line in Louisiana from Acadia parish to a connection in Morehouse parish; 369 miles of 26-in. loop between Bastrop, La. and Hardinsburg, Ky.; a 4400-hp compressor station near Madison, Ind.; installation of 9340 hp at four existing stations; underwater crossings of the Mississippi and Ohio rivers; sales lateral facilities; and a sales meter station.

Simultaneously, the company announced that it has developed a new source of natural gas in southern Louisiana. Texas Gas acquired the Louisiana Natural Gas Corp., a gathering system which includes about 110 miles of lines which now distribute about 100 MMcf daily to industrial customers in the Lake Charles area. The Owensboro firm has also formed Texas Northern Gas Corp. to provide a second gas gathering network in southwestern Louisiana.

In a separate application to the FPC, Texas Gas asked for authority to build a compressor station on its main 20-in. line near Shreveport with 3960 installed horsepower. The station would increase daily capacity of the 20-in. line from the Carthage field in east Texas to near Sharon, La. by about 48 MMcf. Cost is estimated at $1,046,000.

United Wants to Tap Gas Reserves in Gulf

United Gas Pipe Line Co., Shreveport, has applied to the FPC for authority to construct and operate natural gas facilities in offshore fields in the Gulf off the coast of Louisiana.

The company would build about 12 miles of 14-in. line from the Pure Oil Co.'s platform southwest to a platform operated by Magnolia Petroleum Co., Continental Oil Co., and Newmont Oil Co. A second section of 10-in. line, about 14 miles long, would extend from there to another platform operated by the oil companies.

The latter section, however, would not be needed until proved reserves in the offshore fields reach 1 trillion cu ft. Magnolia may build the line and, after determining that adequate reserves exist, sell it to United if FPC approves.

Cost of the first line is estimated at $1,279,657; the second would cost $1,222,455.

This mobile machine shop is one of three being used by Wisconsin Natural Gas Co., Racine, for repairing gas leaks. The units, conceived by R. L. Goodland, gas engineer, and designed by Paul Bardeen, transportation engineer, have increased the firm's efficiency in handling such repairs by 400%.

Formerly a six-man repair crew could handle three leaks a day; with a mobile unit, three men handle six or seven leaks a day.

To achieve a self-contained operation, a 160-cfm Worthington air compressor, driven by a power takeoff from truck drive shaft to power air tools, is used. The photograph shows the mobile unit as it looks before the compressor is enclosed in its specially designed compartment. Tools, hose reels, and other necessary equipment are also housed in the compartment. Digging is accomplished with a grab bucket mounted at the rear of the truck.

The units cost $17,500 each, including air tools.

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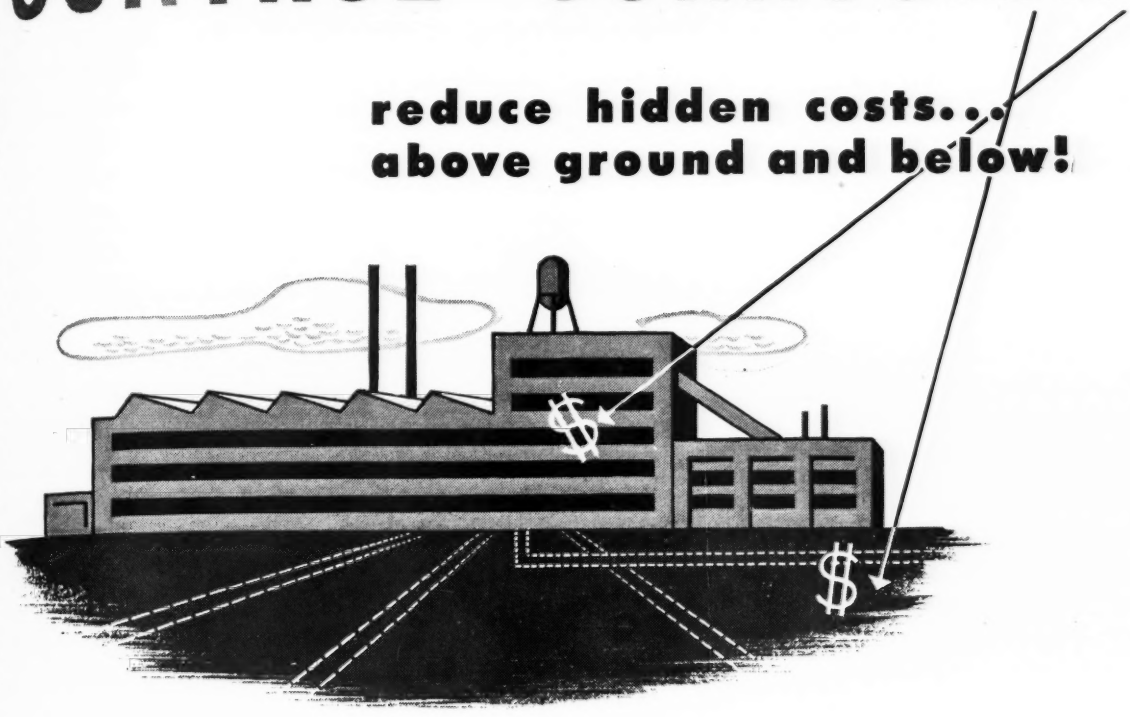
reduce hidden costs... above ground and below!



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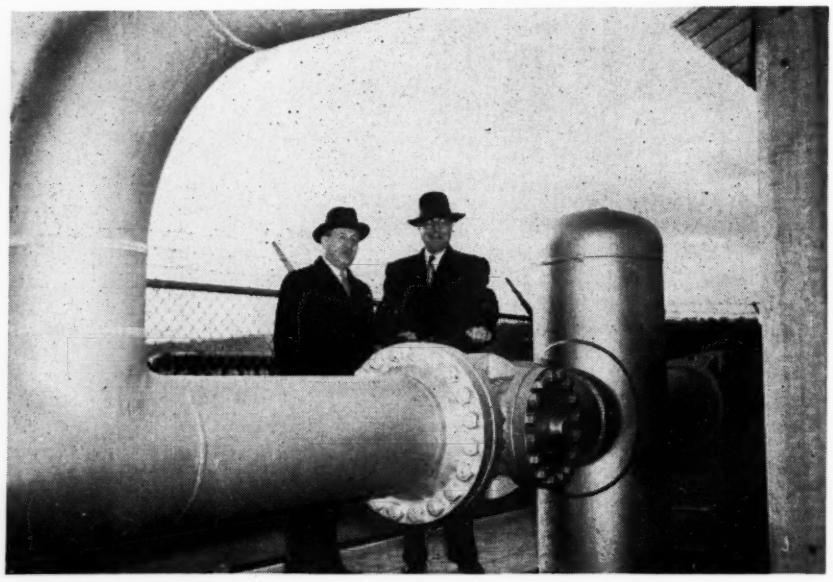


TRANSCO PRESIDENT Claude A. Williams stands ready to twist the valve wheel at the climax of ceremonies, as Benjamin Feinberg (left) looks on.

BUILDER Ray C. Fish, president of Fish Engineering Corp., points to terminus of line as Claude Williams beams approval.

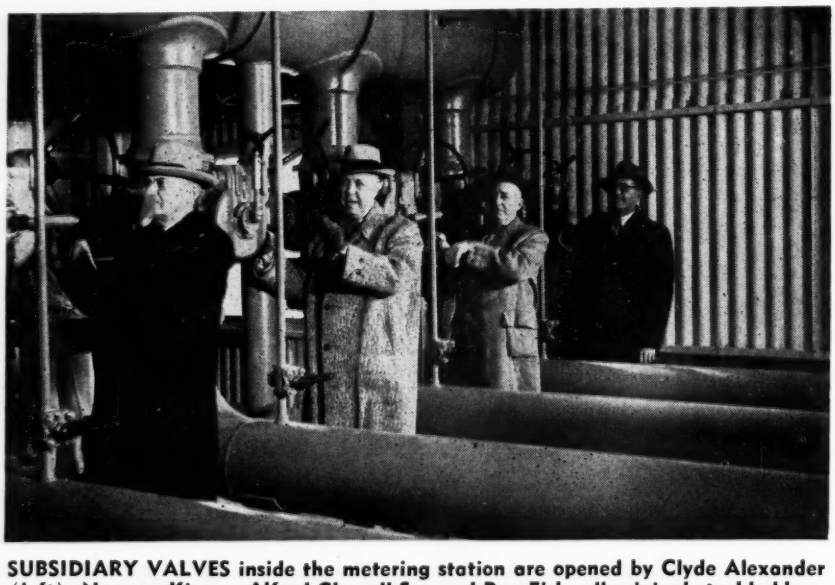
Transco Dedicates New York Line

Albeit a bit late, natural gas finally arrived in New York Jan. 16.

In a biting wind whipping off the Hudson river, Claude A. Williams, president of Transcontinental Gas Pipe Line Corp., builder of the mighty 1840-mile Texas-to-New York line, stepped up to the big valve at Manhattan's shore and cleared the way for 250 MMcf per day (initial capacity) to flow in.

Next was Benjamin Feinberg, chairman of the New York State Public Service Commission, who lighted the symbolic torch.

The gas was originally scheduled to reach the systems of the five New York firms in December.



SUBSIDIARY VALVES inside the metering station are opened by Clyde Alexander (left), Norman Kinsey, Alfred Glassell Sr., and Ray Fish, all original stockholders.

300 Million More for California Is El Paso Aim

A fattening up of its present customers is the aim of a new construction scheme filed last month by El Paso Natural Gas Co. For $83 million, the company would step up its system capacity by 400 MMcf per day, increasing output to Southern California and Southern Counties Gas Co.'s, Los Angeles, and Pacific Gas & Electric Co., San Francisco, by 150 MMcf per day each.

The remaining 100 million would be added supply for present customers along the route of the El Paso trunk, in west Texas, Arizona, and New Mexico.

PG&E just began receiving its first shipments of El Paso gas at year's end, and the southern companies had just boosted their capacity in recent months.

Included in the project are 93 miles of loops, on the mainline from Permian basin to the California line, 180,850 hp in new and existing mainline compressor stations, 311 miles of field lines, 42,350 hp in new and existing field booster stations, and seven amine recovery plants.

The facilities to serve customers en route would be completed by Oct. 1, according to El Paso plans, while the portions designed to increase sendout to the California companies would be in service a year later.

El Paso President Paul Kayser recently told the Texas Railroad Commission that on the east side of the Permian basin, whence the company draws its supplies, a reserve of more than a trillion cubic feet lies. Included in the area is the fabulous Scurry county, Texas.

Project Planned to Meet Increased Ohio Demands

Construction of a 65-mile, 26-in. line to carry additional gas to meet demands in northeastern Ohio has been proposed to the FPC by East Ohio Gas Co., Cleveland.

To cost $4,382,170, the line would connect New York State Natural Gas Corp.'s system near Petersburg, Ohio with a point in Summit county, Ohio. New York State, an affiliate of East Ohio, would deliver gas to the latter company at Petersburg.

New York State is planning a companion project to develop additional storage facilities in western Pennsylvania and to build a section of line to connect with the one proposed by East Ohio.

Natural for Watertown

Watertown and other communities in northeastern New York will be converted from manufactured to natural gas service upon completion of construction recently authorized by the Federal Power Commission.

New York State Natural Gas Corp. will make additional sales of gas to Niagara Mohawk Power Corp., Syracuse, and Niagara will build a 55-mile, 10¾-in. line from Fulton, N. Y. to Watertown. Cost of the construction is estimated at $1,991,000.

Towns to be served along the route of the new line are Mexico, Pulaski, Mannsville, Adams, Adams Center, Sandy Creek, Lacona

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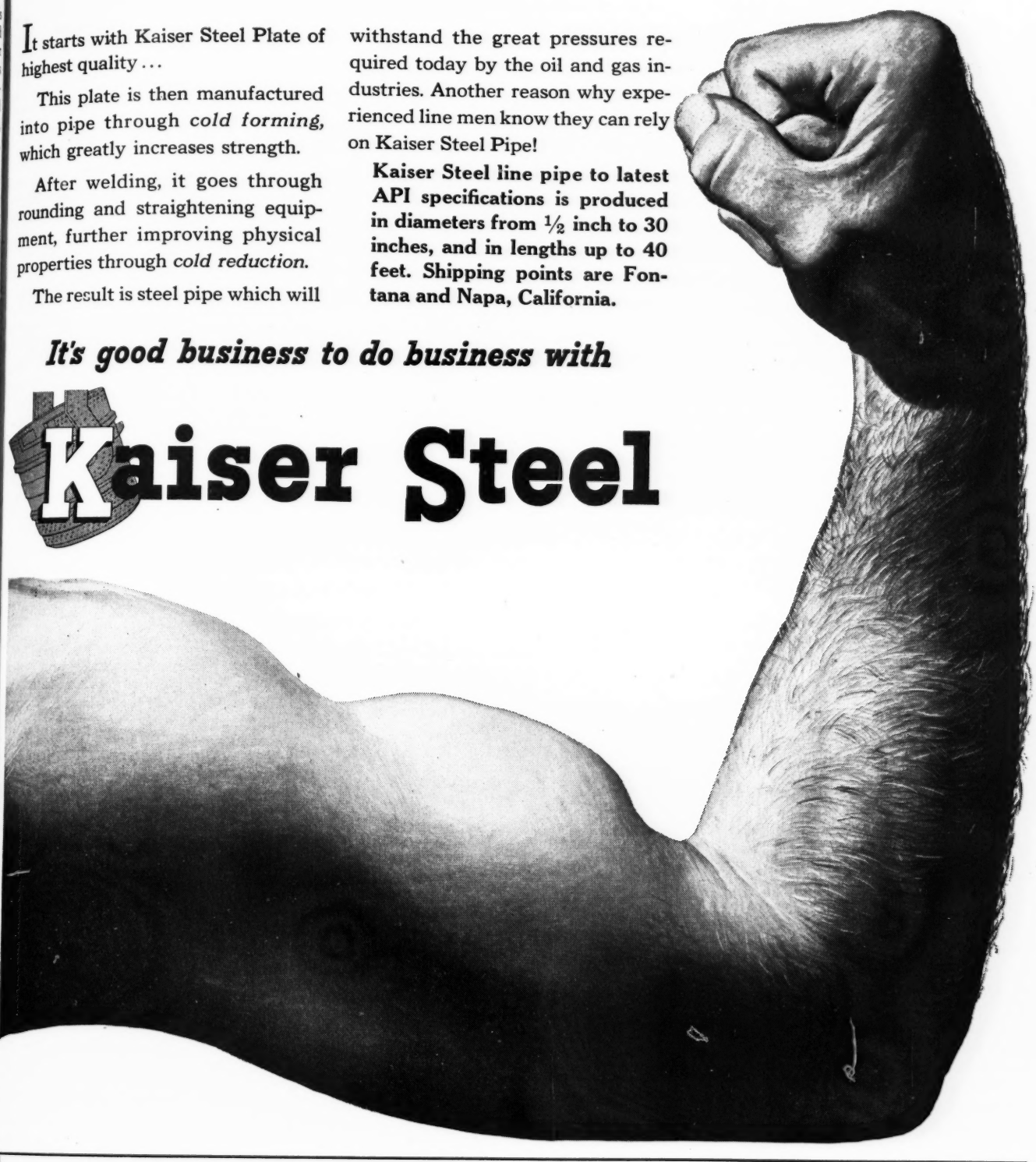
Kaiser Steel line pipe to latest API specifications is produced in diameters from ½ inch to 30 inches, and in lengths up to 40 feet. Shipping points are Fontana and Napa, California.



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Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	8⅝" to 22" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5 5/16" to 12¾" O.D.	Up to 55'	.188" to .400"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	24" to 30" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser

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Northeastern Attempt to Take New England Fails

A move by Northeastern Gas Transmission Co., Springfield, Mass., to bar its competitor from the big New England natural gas market was quashed last month when the Federal Power Commission denied that part of a recent application of Northeastern's which would have permitted Northeastern to serve those markets already reserved by FPC for Algonquin Gas Transmission Co. of Boston.

After Northeastern had received a certificate for service to certain New England markets (*GAS*, December 1950, p. 88), it submitted a new application whereby it would take over the territory Algonquin is supposed to supply—if and when approval is granted. Also included were plans to serve Greenfield Gas Light Co. and Gardner Gas Fuel and Light Co., Mass.; Dover, Portsmouth, and Exeter, N. H.; and Biddeford, Saco, and Portland, Me. Rehearing was set to start Jan. 29.

Northeastern had wanted to add 441 miles and an 8000-hp compressor station to the authorized system, bringing delivery capacity to 414 MMcf per day with peak load delivery of 500 MMcf. Northeastern's parent and supplier, Tennessee Gas Transmission Co., was to seek a capacity increase to up deliveries to Northeastern from 156 million to 350. (Transcontinental Gas Pipe Line Corp., another supplier, is authorized to give Northeastern 64 MMcf.)

A complicated web of interventions in the Algonquin and Texas Eastern Transmission Corp. cases (Texas Eastern is Algonquin's parent and supplier) was given blanket denial.

Meanwhile, these latter cases were consolidated with two others—United Gas Pipe Line Co. and Atlantic Gulf Gas Co.—and hearing was to start on all four Jan. 23. Initial decision procedure was eliminated to speed disposition.

The consolidation now spreads the case all over the map. United has two applications in the fire, one to serve Texas Eastern along with Mississippi River Fuel Corp. (which serves gas in the St. Louis area), the other to supply an affiliate, Atlantic Gulf. Atlantic Gulf would take gas to the southeastern Atlantic seaboard.

Transco System Extension Tentatively Approved

A $4,189,252 project proposed by Transcontinental Gas Pipe Line Corp. has received a presiding examiner's initial approval and is subject to review by the FPC. The firm wants to build an extension of its main line to provide an auxiliary connection for delivery of gas to the metropolitan New York area.

The new 11-mile line would extend from a point on Transco's line near East Carteret, N. J. to the Bay Ridge section of Brooklyn. Exact length and details of the line depend upon final survey and purchase of rights-of-way.

Since a break at any point on the mains would cause almost immediate failure of the natural gas supply to New York companies the presiding examiner stated that the alternate route would provide far greater security of supply.

TGT Files Application to Boost Capacity 45 MMcf

Tennessee Gas Transmission Co., Houston, which already has an authorized system capacity of 1.31 billion cu ft per day, is going to carry gas to the border of New England, and still has a lot of construction ahead before this goal will be reached, has come up with a bold new scheme.

Under terms of the new application, the Houston company would build 253 miles of loops and 100 miles of laterals, and install 61,000 hp compressor capacity to deliver 45 million a day—15 million each—to Iroquois Gas Corp., Buffalo; United Natural Gas Co., Oil City, Pa.; and Equitable Gas Co., Pittsburgh. Cost would run to $36,241,000.

The three companies are already Tennessee customers.

New Producing Firm to Step Up Hugoton Search

Production of more natural gas in southwestern Kansas and Oklahoma was promised last month by Hugoton Plains Gas & Oil Co., a new company which purchased a large block of gas reserves in the two states in a $36 million transaction.

Within six months the company expects to drill 30 to 40 new wells and increase production from the 115,000 acres purchased to about 120 MMcf daily. Currently, 154 wells in the properties are producing 90 MMcf a day. All gas produced is to be sold to Northern Natural Gas Co., Omaha.

Principal stockholders of Hugoton Plains are J. S. Fluor, vice president, Fluor Corp., Los Angeles; William R. Staats Co. of Los Angeles, and Fred R. Tuerk, Midwestern industrialist.

Price Fix Rehearing Denied

Three natural gas companies — Kansas Nebraska, Northern Natural and Panhandle Eastern—have been denied a rehearing by the Kansas Supreme Court on their appeal from a Kansas Corporation Commission order fixing a minimum wellhead price of 8 cents per Mcf in the Hugoton field.

The court said it could not agree with arguments by the companies that since a large percentage of the gas they produce or purchase in the field is transported in interstate commerce, price fixing authority would rest with the FPC instead of the state commission.

Appeal of a similar case in Oklahoma recently resulted in a U. S. Supreme Court decision upholding the state's right to fix wellhead prices.

Equitable to Acquire Firm

In a joint application filed with FPC last month, Equitable Gas Co., Pittsburgh, asked authorization to acquire the natural gas facilities of its subsidiary, Pittsburgh & West Virginia Gas Co., also of Pittsburgh.

The companies stated that their facilities are interconnected and integrated.

Pipeline Newsnotes

Standard Oil Co. of California announced last month that it will spend between $5 million and $10 million for oil and gas exploration and development in Utah during 1951. T. S. Peterson, president, stated that the company's well at Red Wash in eastern Utah has made substantial gas showings which could mean the beginning of a good supply of natural.

Growth of its natural gas, natural gasoline, and LP-Gas operations has resulted in the formation of a natural gas department in the oil production division of Lion Oil Co., El Dorado, Ark. William M. Wilson has been named superintendent of the department.

Geologists believe that parts of Dade, Walker, and Catoosa counties in northwest Georgia have some of the state's best oil and gas possibilities, according to a recent report by the state oil and gas commission. The region is a deep paleozoic area some 20,000 ft thick.

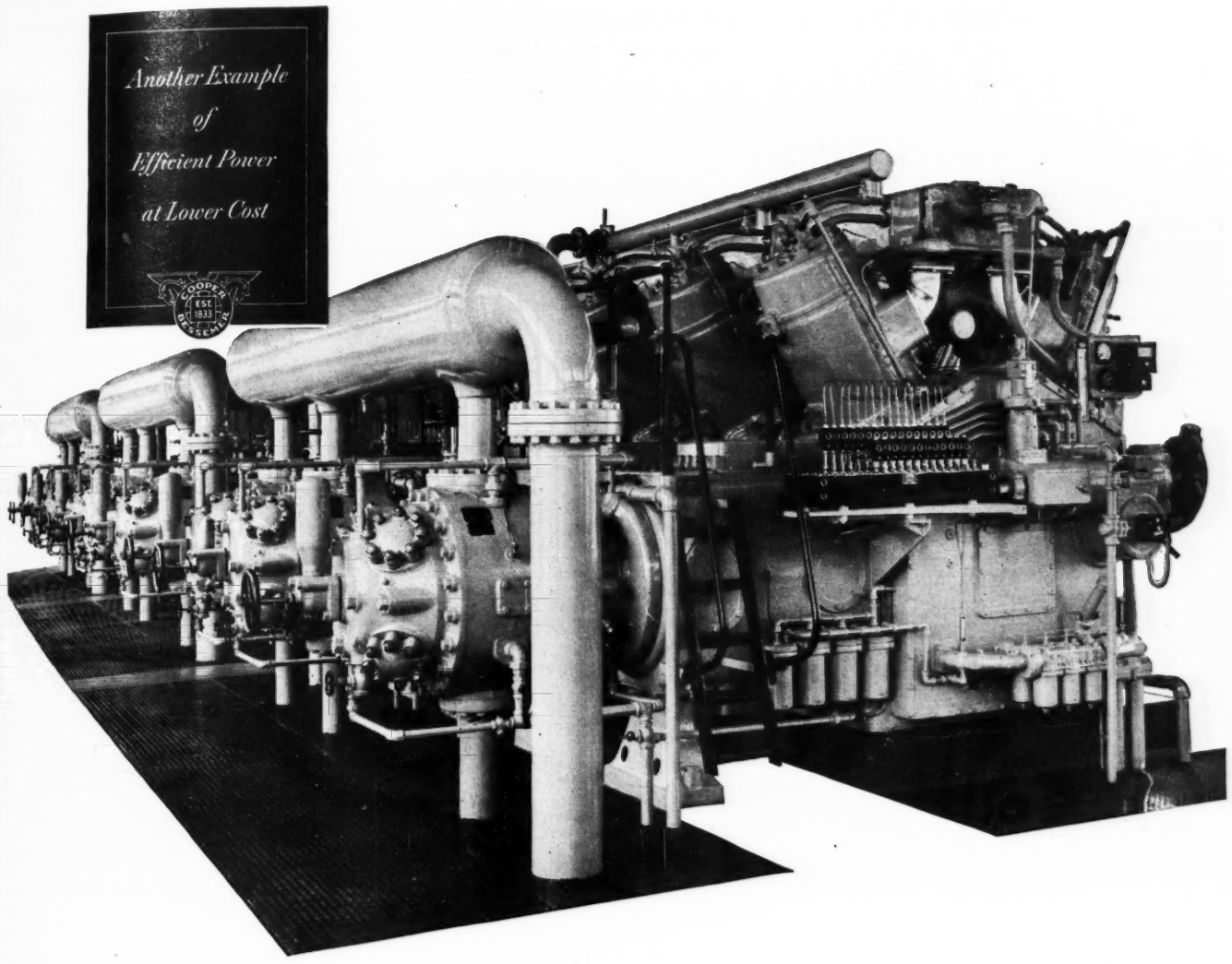
Wilson-Snyder Manufacturing Division of Oil Well Supply Co., a U. S. Steel subsidiary, has announced plans to expand its line of centrifugal pumps to include 19 general purpose pumps ranging from 5 to 250 hp. The new pumps were formerly manufactured by National Transit Pump & Machine Co., Oil City, Pa., which liquidated its properties early this year. Wilson-Snyder's plant is located at Braddock, Pa.

To extend natural gas service to customers now served with manufactured, Southwestern Virginia Gas Transmission Co., Martinsville, Va. has applied to FPC for natural gas from Transcontinental Gas Pipe Line Corp. A 16.8-mile line from a point near the North Carolina-Virginia state line to Martinsville would be built by the company, which would sell the gas to Southwestern Virginia Gas Co., an affiliate, for resale in Martinsville and vicinity.

Increasing demands on its system have prompted Equitable Gas Co., Pittsburgh, to request FPC permission to construct a new compressor station in Washington county, Pa. Estimated to cost $1,045,000, the project would include three 1100-hp gas engine-driven units and connecting lines, a glycol dehydration plant, gas scrubbers, and auxiliary equipment.

El Paso Natural Gas Co. plans to begin erection of an 18-story building, to be the west Texas city's tallest, on Feb. 15. Razing of one-story buildings on the site at Texas and Stanton streets was to begin Feb. 1. Vertical fins of reinforced concrete will shade windows and increase efficiency of the air conditioning system.

A hearing on proposed changes in facilities previously authorized for Southern Natural Gas Co., Birmingham, was scheduled to get under way Jan. 22, the FPC announced. The company wants to substitute a 10.4-mile 8⅝-in. loop line for an approved 4¾-mile 6-in. loop. The change would enable it to supply more gas to Sylacauga and Talladega, Ala.



How to trade engine heat for cold cash!

IF you're a technical man, you know that an engine simply converts the heat of fuel combustion into usable motion or power. You also know that there's always *unused* heat that must be dissipated or somehow disposed of. In sizeable engine installations this can be a big problem, involving lots of costly cooling equipment and valuable space.

Here again, recent Cooper-Bessemer developments are saving money. For example, hundreds of big engines like the Cooper-Bessemers shown above are used to drive compressors on cross-country pipe lines. Because of the Cooper-Bessemer Turboflow and supercharging developments and other advancements, much more combustion heat can now go to produce *power*, leaving much less waste heat to be dissipated. Thus the cost of cooling equipment, piping and installation can now be reduced by thousands of dollars. It's a huge plus saving over and above the gains of greater fuel economy and increased power.

Far-reaching developments like these are constantly being worked out at Cooper-Bessemer. And they're being applied to heavy duty engines for *all* services . . . stationary power, locomotive, marine and other mobile uses. If you have a stake in power, be sure to find out about the *new* things being done by one of America's *oldest* engine builders.

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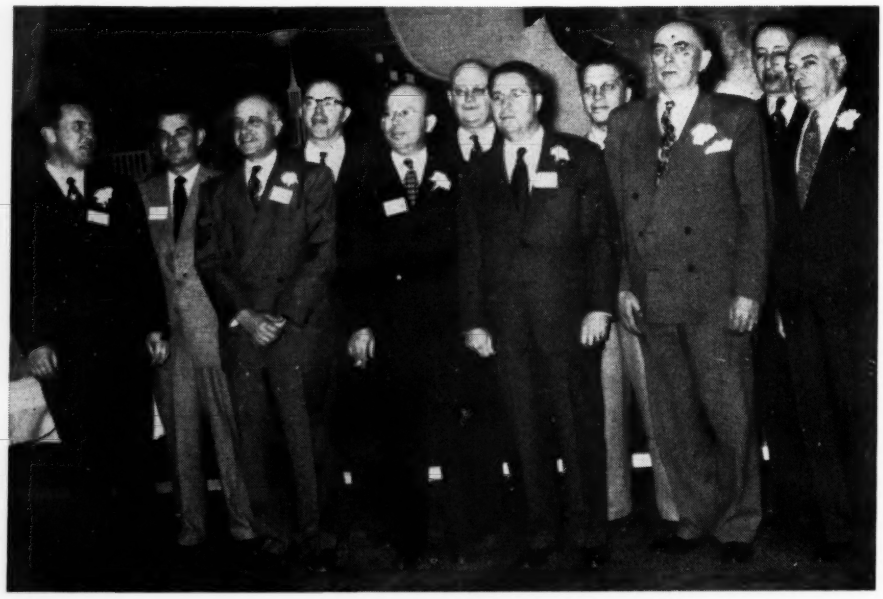

OFFICERS of the Pipe Line Contractors Assn. are (left to right): Richard A. Gump, executive secretary, E. G. Morrison, C. C. Bledsoe, E. J. Mahoney Jr., T. A. Hester, Ray L. Smith, L. H. Favrot, M. S. Williams, R. A. Conyes, N. A. Saigh, and H. C. Price. Morrison, Bledsoe, Hester, Smith, Williams, Saigh, and Price are directors. Not present was Robert Thomas, a director.

Biggest Pipeline Year Foreseen by Contractors

An even better year than 1950 is in store for pipeline contractors.

Such was the consensus of the 400 contractors and equipment manufacturers who gathered for the annual convention of the Pipeline Contractors Assn. at the Shamrock hotel in Houston Jan. 9 and 10.

Contractors have their sights set upon 20,000 miles of lines, the bulk of which will be natural gas, as a quota for 1951.

A highlight of the meeting was the presentation of a plan for a coordinated movie production by the association and Southern Gas Assn. After the idea had first been suggested by the pipeline group to several gas industry executives, the SGA adopted it as its own project. Robert Suttle, managing director of SGA, and James Floyd, advertising director of Lone Star Gas Co., Dallas, gave brief talks at the meeting, outlining SGA's plans for the project.

Other program highlights were a discussion, with slides, of X-ray inspection of welds, by W. A. Saylor, Consolidated Western Steel Corp., Los Angeles; a recounting of pipeline construction during 1950, by Oliver Klinger, *Pipe Line News;* and remarks pertinent to income tax matters as they affect pipeliners, by P. M. Mattison, Price, Waterhouse, Houston.

Election of officers saw L. H. Favrot, incumbent vice president, succeed Ray L. Smith as president, with Robert A. Conyes and Robert Thomas (who heads the movie committee) taking over as vice presidents, and E. J. Mahoney Jr. succeeding N. A. Smith as treasurer.

Richard A. Gump continues as executive secretary.

PIPELINE PEOPLE

M. F. Hazel

Alex Quayle

Last month Oil Well Supply Co., Dallas, a U.S. Steel subsidiary, appointed M. F. HAZEL as director of engineering and ALEX QUAYLE as chief engineer in charge of all product design. Mr. Hazel has been general manager of sales for three years and Mr. Quayle was chief engineer at Imperial Works, Oil City, Pa. Both will headquarter in Dallas.

Kentucky West Virginia Gas Co., Ashland, Ky. has announced the appointment of COLEMAN D. HUNTER as chief geologist and of GEORGE W. HEREFORD as gas engineer. Both will headquarter in Ashland.

HARRISON F. CARR, who retired Nov. 1 as New Orleans and Baton Rouge district manager for United Gas Pipe Line Co. and Union Producing Co., Shreveport, died last month. Mr. Carr was engineer in charge of construction of the pipeline which first brought natural gas to New Orleans, and he has been credited with helping to develop the practice of floating lengths of pipeline through canals and ditches.

PROGRESS REPORTS

Planned

ALGONQUIN GAS TRANSMISSION CO., Boston, facilities to serve designated companies in Mass., R. I., Conn., and N. J. when adequate gas supplies are proved.

ARKANSAS-MISSOURI POWER CO., Blytheville, Ark. To build line from Big Inch to serve 12 towns in two states. To start within year.

ATLANTIC GULF GAS CO., 1500 miles, Alabama to Florida, Georgia, South Carolina.

CAROLINA NATURAL GAS CORP., Charlotte, N. C., 470 miles, 11 lines, from Transcontinental Gas Pipe Line Corp. main line to North and South Carolina communities.

CENTRAL WEST UTILITY CO., Kansas City, Mo. for 30 miles of 12-in. from its system in Clay county to Cities Service facilities at boundary of Kansas City.

CITIZENS GAS CO., Stroudsburg, Pa., **BANGOR (PA.) GAS CO., PEN ARGYL GAS CO.,** subsidiaries of Penn Fuel Gas Inc., laterals to receive gas from Manufacturers Light & Heat Co.

CONSUMERS GAS CO., Toronto, Can., 85 miles, Buffalo to Toronto.

EAST OHIO GAS CO., Cleveland, 65-mile, 26-in. line from near Petersburg, Ohio, to Summit county.

EL PASO NATURAL GAS CO., to increase deliveries to Phoenix, Ariz., 31 miles 16- and 10-in.; 11.5 miles 4½-in.; 5.5 miles 12¾-in.; six metering and regulating stations. To increase system capacity by 400 MMcf, 93 miles 26 & 30-in. loop between Permian basin & Ariz.-Calif. state line; 180,850 hp in new & existing stations; 311 miles in its field system; 42,370 hp in field stations, and appurtenant facilities.

EQUITABLE GAS CO., Pittsburgh, compressor station in Washington county, Pa. including 3300 hp, glycol dehydration plant, scrubbers, etc.

GEORGIA NATURAL GAS CO., Albany, Ga., Phenix City, Ala., to Tallahassee with laterals and branches, $5.1 million.

INTERSTATE POWER CO., Dubuque, Iowa. 26½-mile 8⅝-in. line to the Clinton, Iowa area. Includes a submarine crossing of the Rock river and a double submarine crossing of the Mississippi.

IOWA-ILLINOIS GAS & ELECTRIC CO., Davenport, Iowa for 1½ miles of 8-in. line across the Mississippi river between Bettendorf, Iowa and Moline, Ill. A suspension bridge would carry ½ mile of the line.

KANSAS-NEBRASKA NATURAL GAS CO. INC., Phillipsburg, Kan. for 3 compressor stations at Holcomb & Albion, Kan. and Grand Island, Neb. totaling 3570 hp; extra 2000 hp at Palco station; cooling and dehydration equipment; replacement of 89½ miles of line with large pipe; 425½ miles new line.

LAKE SHORE PIPELINE CO., ERIE GAS SERVICE CO. INC., and GRAND RIVER GAS TRANSMISSION CO., pipeline from a Meadville, Pa. connection with Tennessee Gas Transmission's line westward to Ohio.

LYNCHBURG (VA.) GAS CO., 15-mile line from Transcon's line in Appomattox county, Va. to Lynchburg.

MICHIGAN CONSOLIDATED GAS CO., 180-mile, 24-in. line paralleling present line from storage fields at Austin, Mich. to Detroit.

MIDSOUTH GAS CO., Little Rock, 240 miles northerly from Helena, Ark.

MISSISSIPPI RIVER FUEL CORP., St., Louis, 22,000 hp in 8 authorized compressor stations and 5500 hp in a new one.

MISSOURI CENTRAL NATURAL GAS CO., Macon, Mo., 60 miles 6-in. from near Hannibal, Mo. to Macon.

NEVADA NATURAL GAS PIPE LINE CO., 114 miles of 10¾-in. line from Topock, Ariz., to Las Vegas, Nev. Includes a 4-in. branch starting 4½ miles west of Boulder City and a 2½-in. branch from 2½ miles west of Needles into the city. To be finished early as possible in 1951.

NEW RIVER GAS CO., Radford, Va., 50-mile line from Atlantic Seaboard's system in W. Va. to a point near Radford with laterals to four towns.

NIAGARA MOHAWK POWER CORP., Syracuse. Stub laterals and loop to serve Albany, Utica, and vicinities include 45 miles of 6- to 16-in.

NORTHERN INDIANA FUEL & LIGHT CO., Auburn, Ind., 31-mile, 8⅝-in. line to carry gas to northeastern Indiana. Cost: $511,315.

NORTHWEST NATURAL GAS CO., for 700 miles in Washington, Idaho, Oregon.

OKLAHOMA NATURAL GAS CO., Tulsa, 40 miles of 16-in. from Ninnekah to Velma.

PACIFIC NORTHWEST PIPELINE CORP., 2175 miles of 26-in. from southern Texas to Seattle, Wash., Vancouver, B.C., via Oklahoma, Kansas, Colorado, Wyoming, Idaho, Oregon, Washington.

PUBLIC SERVICE CO. OF COLORADO, pipeline from the Piceance Creek field in western Colorado to Grand Junction and Rifle.

PUBLIC SERVICE CO. OF NORTH CAROLINA INC., Gastonia, 365 miles connecting at 10 points with Transcontinental main line in North and South Carolina.

SHENANDOAH GAS CO., Lynchburg, Va., for 49 miles from near Cedarville, Va., to cities in Virginia and West Virginia.

SOUTH CENTRAL ALABAMA NATURAL GAS CO. INC., 150-mile pipeline from a connection with Southern Natural's line in Elmore county.

SOUTH GEORGIA GAS CO., Atlanta, for 527 miles from northern Georgia into Florida to serve new markets in the two states.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.,** Los Angeles, on their 20- and 22-in. loop line from the Goleta dry gas field to L. A. SoCounties will complete its section in 1951 with a line from near Summerland to Goleta. SoCal will build a 21-mile loop from the Santa Clara river to the Simi tie-in.

SOUTHERN NATURAL GAS CO., Birmingham, 105 miles 10¾-in., Bolingbroke, Ga. to Aiken, S. C.; 19 miles 8⅝-in., 29 miles 12¾-in. Carthage, Texas, to Logansport, La.; 78 miles 14-in., Logansport to Perryville, La.; 40 miles 24-in. loops; 9000 hp in various compressor stations.

SOUTHWESTERN VIRGINIA GAS TRANSMISSION CO., Martinsville, 17-mile line from Transcon's line near N. C.-Va. state line to Martinsville.

TENNESSEE GAS TRANSMISSION CO., Houston, 45-mile spur from Buffalo, N. Y. to near Niagara Falls, N. Y. Also 266 miles loops between Texas & New York, 100 miles of laterals, 72,000 hp to be added, and crossing of Niagara river. To serve Manufacturers Light & Heat Co.: 25 miles 26-in. loop and 2000 hp along its Buffalo extension. To up capacity and develop a storage project: 438 miles of loop on New England & Buffalo extensions; 44,000 hp in existing or authorized stations, 14,000 hp in a new station. To serve Iroquois Gas, United Natural, and Equitable Gas: 253 miles loop; 61,000 hp; 100 miles miscellaneous lines.

TEXAS EASTERN TRANSMISSION CORP., Shreveport, to boost capacity to 476 MMcf, 791 miles 30-in. from Kosciusko, Miss., to Connellsville, Pa.; seven compressor stations with 46,400 hp on new line, six with 52,500 hp on existing line; short lines in New York area.

TEXAS GAS TRANSMISSION CORP., compressor station with 3960 hp on its main line near Shreveport. Also 564 miles main and loop in La., Ark., Miss., Tenn., and Ky. Includes 195-mile line from Acadia parish to Morehouse parish, La. (24-

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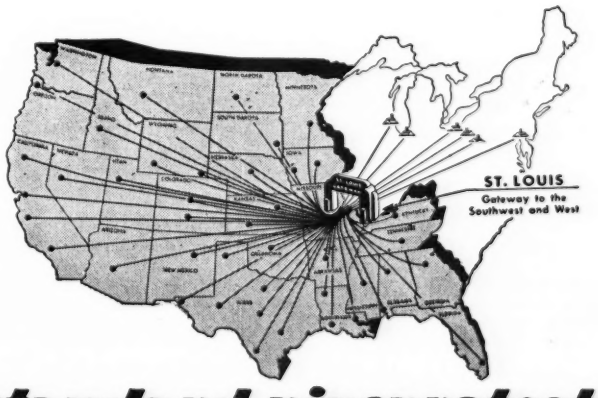

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and 26-in.) and 369 miles 26-in. loops. Also 4400 hp near Madison, Ind.; 9340 hp at 4 existing stations; underwater crossings of Ohio & Mississippi.

TEXAS ILLINOIS NATURAL GAS PIPELINE CO., Chicago, to build during 1951 100 miles 30-in. from Effingham to Sibley, Ill. and 92 miles 30-in. from Sibley to Joliet.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston, 17 miles 30- and 10¾-in. from Bergen county, N. J. to Paterson, N. J.

UNITED GAS PIPE LINE CO., Shreveport, 1005 miles in Texas, Louisiana, and Mississippi. Includes 451 miles 30-in., 6 miles 26-in., 53 miles 24-in. from Agua Dulce field in south Texas to Monroe, La.; about 245 miles of 30, 26, 24, and 20-in. from Gulf of Mexico northeast to Jackson, Miss.; 215 miles from this line to near Kosciusko, Miss.; 24 miles 8, 12, and 16-in. in south Louisiana; 16 miles of 16-in. from Koran gasoline plant site, La., to its Carthage-Sterlington line in Louisiana; 4000-hp compressor, dehydration plant. In offshore fields in Gulf of Mexico: 12.3 miles 14-in. line, 14.4 miles 10-in.

UTAH NATURAL GAS CO. to build a 360-mile line from the San Juan basin to Salt Lake City. A secondary line would run from Last Chance field (Wayne county, Utah) through Sevier and Sanpete counties.

UTAH PIPE LINE CO., Dallas, for a 392-mile line from Aztec, N. M. to Salt Lake City. Includes 374 miles of 22-in. and 18 miles of 16-in.

VALLEY GAS PIPE LINE CO. INC., Houston, $144.5 million, 1000 miles of 30-in., from Hardin county, Texas, to southern Michigan, plus 500 miles of 24-in. in Texas and Louisiana, plus laterals, two 13,500-hp compressor stations, plus others aggregating 70,000 hp. Completion is scheduled for April 1, 1952.

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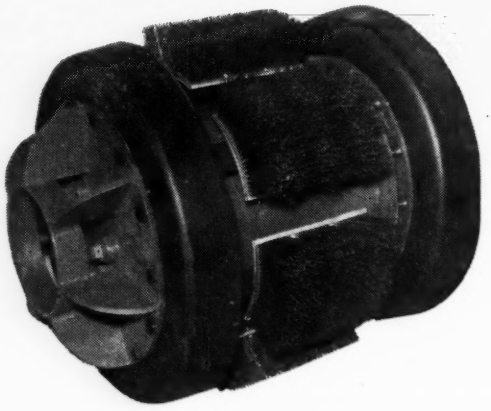
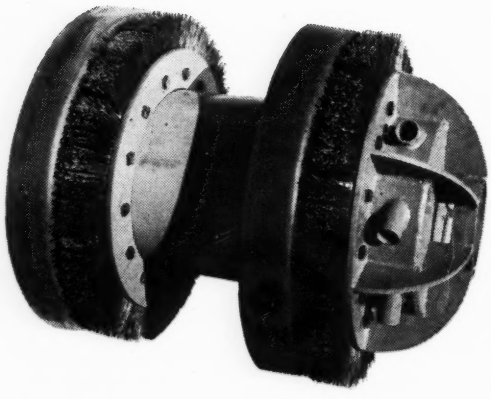


24" Size New Design TYPE GP PIGS with Brushes Mounted on Arched Springs to Compensate for Wear



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*Patents Pending

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WESTCOAST TRANSMISSION CO. INC., Wilmington, Del., 615 miles, including 277 miles from Sumas, Wash. to Portland, Ore. with short branches to a number of cities in the two states; 266 miles south from the Osoyoos, B. C. area to Spokane and Hanford, Wash.; and 72 miles of laterals and 13 measuring stations.

Approved

CITIES OF BOONEVILLE, RIPLEY, BALDWYN, Miss., to connect with Tennessee main line in Benton county, 16 miles of 6-in., 23 more miles, 11-mile tap.

CITY OF TRINIDAD, COLO., a 35-mile, 8⅝-in. line from Colorado Interstate's facilities to a distribution system to be built in Trinidad.

MISSISSIPPI RIVER FUEL CORP. for 4 miles 12-in. line and not more than 7 gas wells to test storage possibilities of Waterloo (Ill.) oil field.

NIAGARA MOHAWK POWER CORP., Syracuse, 55-mile, 10¾-in. line to supply Watertown and other communities.

PIEDMONT NATURAL GAS CO. INC., Spartanburg, S. C., six laterals totaling 74 miles from Transcontinental main line to North and South Carolina cities.

SOUTHEASTERN MICHIGAN GAS CO., Chicago, 55 miles of 12-in. from connection with Panhandle Eastern main line in Oakland county, Mich., to Marysville, Mich.

TEXAS ILLINOIS NATURAL GAS PIPELINE CO., Chicago, to build 72 miles of line in Texas and change compressor units to boost capacity.

TRANSCONTINENTAL GAS PIPE LINE CORP. for an 11-mile line from East Carteret, N. J. to Brooklyn. Also 45,675 hp in compressor capacity at existing stations and 41 sales meter stations.

Under Way

ATLANTA GAS LIGHT CO. has Tulsa-Williams Co., Chamblee, Ga. building 17 miles of 24-in. main to increase supplies to the Atlanta area.

CITY OF FLORENCE, ALA. has Modern Welding Co. Inc., Owensboro, Ky., at work on 84 miles of 1- to 8-in. city system and 50 miles service lines, 2 regulator stations. 11 miles completed.

COMMONWEALTH NATURAL GAS CO. has Ray L. Smith & Son Inc. at work on 84 miles of 12-in. from near Richmond, Va. to Norfolk and Newport News. Also crossings of the James and Elizabeth rivers.

MIDSOUTH GAS CO. has Tulsa Construction Co. at work on 40 miles of 12-in. from Helena to Forest City, Ark. Work began Jan. 15.

NEW YORK STATE NATURAL GAS CORP., New York, 164 miles of 16-in. from Dryden to Albany, N. Y.; 56-mile line from Dryden terminus to a storage pool in Tioga county, Pa.; facilities for a new storage pool. Also 44½ miles of 16- and 18-in. to connect the Leidy gas field with its system in Penn.

NIAGARA MOHAWK POWER CORP., Syracuse, 7.4 miles 16-in. and 3 miles 12-in. from New York State Natural's Albany line to Niagara's Utica-New York system. 15.3 miles connecting New York State's system with Niagara's Albany county facilities.

NORTHEASTERN GAS TRANSMISSION CO., Boston, 400 miles of line from Tennessee Gas Transmission Co.'s system near Pittsfield, Mass. to Transcontinental's system near Greenwich, Conn. and metering and regulating facilities. To serve companies in Conn., Mass., and N. H. Includes 144 miles 24-in.; 100 miles 16-in.; 255 miles 3 to 12-in. laterals, and 35 meter stations, all to be constructed in 1951.

OKLAHOMA NATURAL GAS CO. has Trojan Construction Co. Inc. at work on 53 miles of 26-in. from Edmond to Depew, Okla. Right of way started. Completion: March 10. Project ties in with Oklahoma Natural's underground storage at Depew.

Coating field joints on barges in the swamplands of South Louisiana.
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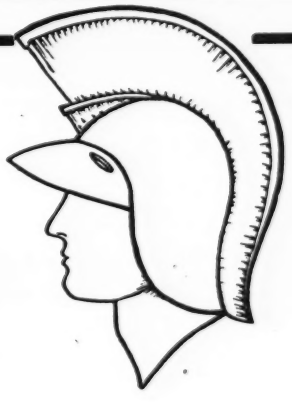

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Vice Presidents James W. Carpenter (center) and Errol W. Doebler look on as Edward F. Barrett, president, turns valve starting flow of Texas and Louisiana natural gas into Long Island Lighting Co.'s new Glenwood gas plant. The gas will be reformed at this station for distribution throughout the company's territory. In addition to the latest type catalytic gas plant, Long Island also has at Glenwood a 5-MMcf holder and large capacity compressor equipment.

SOUTHERN NATURAL GAS CO., Birmingham. Ford, Bacon & Davis to build two Mississippi taps and install 11,000 hp in existing stations. Associated Pipe Line Contractors Inc. at work on 121 miles 16-in. from Mitchell, Ala. to Bolingbroke, Ga. and 40 miles 18-in. from Selma to Elmore, Ala., 50% completed. To be finished March 1.

TENNESSEE GAS TRANSMISSION CO., Houston, 303-mile extension from Erie county, N.Y. to N.Y.-Mass. line; 787 miles of loop along existing or authorized line from Texas to Buffalo; 111,680 hp in existing, authorized, or new compressor stations; 75 miles of laterals.

TEXAS EASTERN TRANSMISSION CORP., Shreveport, 35 miles of 30-in. from Fayette county, Pa., to Westmoreland county, Pa.

TEXAS-ILLINOIS NATURAL GAS PIPELINE CO., Chicago, on its 1331-mile line, to Midwestern Constructors Inc., 100 miles of 30-in. from Mississippi river near Chester, Ill. to Effingham, Ill., 28% completed; 100 miles 26-in. LaGloria to Refugio, Texas, 75% completed; crossing of the Illinois river near Morris, Ill. 60% completed. Bechtel Corp. under way on 409 miles of 30-in. in Arkansas and Missouri. Parkhill Truck Co. stringing for Bechtel and Midwestern. Fish Constructors Inc., Houston, is building compressor stations.

TRUNKLINE GAS CO., Houston, has Anderson Bros. Corp., also of Houston, at work on 180 miles, 26-in., Darnell to Senatobia, Miss., and 217 miles 24-in. Longville to Garwood, Texas. Parkhill Truck Co. stringing above jobs. On 740-mile, Louisiana-to-Illinois line, R. H. Fulton, Lubbock, Texas, is working on 278 miles of 12- and 20-in. and 184 miles of 26-in. Mahoney Contracting Co. under way on 186 miles of 26-in. Four major river crossings to be made under Mississippi, Ohio, Washita, and Red rivers. Anderson Bros. have contract for the first, J. Ray McDermott & Co. for the other three. Project will include six other river crossings for which contracts are not let.

UNION GAS CO OF CANADA, LTD. Shaw Construction Co., Sarnia, Ont., building a 16-in. line extending 61 miles from Windsor, Ont., to Dover township. Includes dual crossings of the Thames and Sydenham rivers. 10 miles completed. Shaw also at work on 5 miles of 6-in. from Dover field, Ont. to Chatham.

UNITED FUEL GAS CO., Charleston, W. Va., 55 miles, 6540-hp compressor stations to deliver gas to storage pools in West Virginia.